



SATURDAY, JULY 27, 1872.

Apparatus for Obtaining Borings by Direct Pressure.

[A paper read before the American Society of Civil Engineers, January 17, 1872, by Theodore Allen, C. E., Member of the Society.]

The purpose for which this apparatus was designed was to enable borings—showing the true bottom or hard bed of the river, to be obtained with greater rapidity than they could be made by the use of the usual boring-rod, especially where the nature of the work necessitated a floating machine.

It was found by the engineers of the Dock Department of this city that, owing to the swell from passing vessels, to the eddies caused by the current in the slips, and to the rise and fall of the tide, the borings obtained by the ordinary means used in such cases were not to be depended upon for accuracy, could be had with difficulty at the best, and occupied so long a time in making, that they decided to endeavor to obtain some apparatus by which the work could be more rapidly pushed.

At the suggestion of Mr. John D. Van Buren, Jr., a member of this Society, connected with the Department, I designed the machine herewith described, and I desire to acknowledge my indebtedness to Mr. Van Buren, and also to Major Watson, of the same Department, for valuable suggestions in regard to the original design, and to the subsequent improvements thereon.

It occurred to me that direct pressure might be employed to force the tube through the overlying strata, from the fact that

to be resisted was as follows: area of boring tube $2.875 \times .7854 = 2.257$ square inches, $6.49 \times 1,000$ lbs. = 6,490 lbs total pressure.

Two feet draft of water was permitted, and it was thought that the scow might be allowed to rise 3 inches, by the resistance of the tube, without interfering with its stability; this gave a resistance per inch of draft of $\frac{6490}{3} = 2,163.3$ lbs., or an

area of water line of $\frac{2163.3}{5.33} = 405.8$ square feet. Making the scow

twice the length of the beam gave $\frac{405.8}{2} = 202.90$ square feet for

one-half or $\sqrt{202.90} = 14.24$ feet breadth of beam; taking into

consideration the weight of the tube and connections, the scow was made 14 feet beam by 28 feet long. Wooden guides, faced with iron, were erected to secure the vertical movement of the piston rods, the tops of the guides being braced, as shown on the drawing.

A clamp to hold the tube when disconnected from the cross-head was secured to the deck, the base of the clamp frame forming a guide for the tube, and extending through the scow, so as to support the tube as far down as possible. This clamp could be removed, leaving a large opening through the scow, so that bent tubes might be drawn through. The arrangement of the clamp was such as to close itself, remaining open and allowing the tube to pass only when the lever was held up by the attendant; thus the tube in being hoisted could only drop, if disconnected from the cross-head, by the carelessness of the attendant.

Water to supply the cylinders and the boiler was carried in tanks built in the scow, the cylinders when discharged emptying back into the tanks. The scow was also ballasted to trim her.

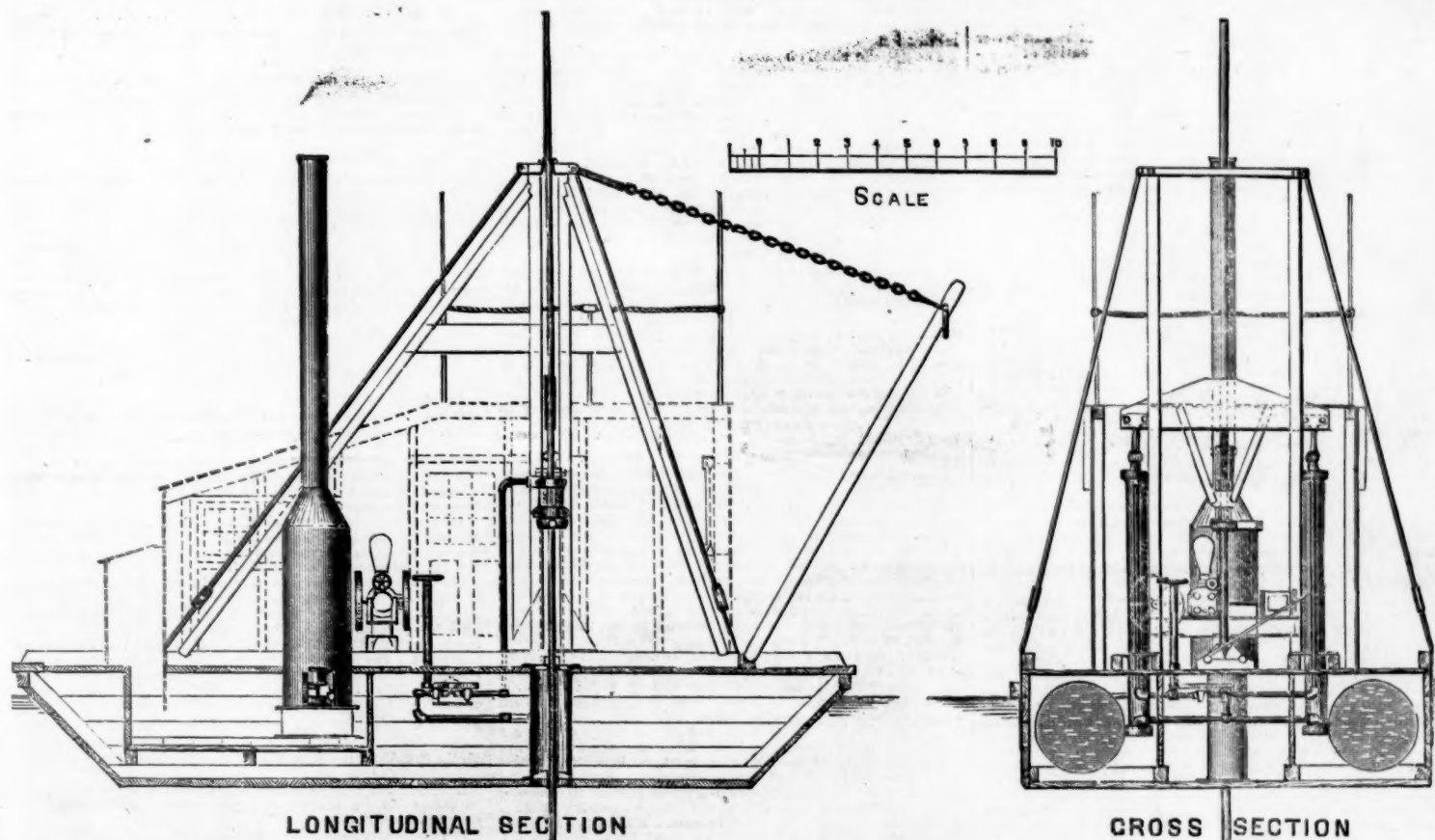
An anchor weighing 150 lbs. and 25 fathoms of chain cable were secured to a windlass at each corner of the scow, so that the scow might be hauled into position in any direction by slackening off on one side or end and hauling up on the opposite side or end.

this depth it is considered that a pile will begin to hold. The cross-head is then clamped to the last length of the tube, and pressure applied; when the pistons have reached the bottom of the cylinders, the cross-head is disconnected and raised—if the ground is soft, to its full height; if in hard ground, to a height of about 5 feet,—and being again clamped, is forced down to the end of the stroke. The reason why the full stroke is not given in hard ground, is on account of the tendency of the tube to spring and bind in the guide, when the pressure is great. The tube is also frequently turned around, as it is found the boring proceeds more easily when this is done.

Additional lengths are added, and this process is continued until the safety-valve lifts, showing that the requisite resisting material has been reached. The process is then reversed and the tube withdrawn. The safety-valve will sometimes lift before the depth at which it has been expected the tube would stop has been reached; this generally is caused by boulders. If, after turning the tube and applying the pressure several times, the tube will not work clear, it is withdrawn, and the position of the scow slightly altered; when the tube is again driven down, two or three soundings will suffice to show the character of the obstruction. In some cases, the tenacity of the soil is such that the scow will be drawn down by the attempt to withdraw the tube until the deck is at the level of the water; the continued strain caused by this immersion, after a short time, is sufficient to overcome the difficulty.

In 50 feet of mud, sand and gravel, the average time occupied is 45 minutes, which includes withdrawing, uncoupling and recording. Ordinarily 7 to 8 soundings are taken in 6 hours. The greatest length of tube so far used has been 114 feet, and the greatest depth penetrated has been 87 feet 10 inches.

The machine has been in actual operation over a year, and during that period over 1,500 borings have been made; nearly 600 from September 1 to December 31, 1871. It has been successfully worked in 60 feet of water, and has been used in all weathers.



no difficulty had been experienced in driving tubes for water through gravel, sand and clay, and even through the softer species of rocks, and that that which had been accomplished by percussive force might be as readily accomplished by sustained pressure. Hydraulic pressure was chosen, as being the most readily controlled, easily managed, and most certain in its action.

As a basis, it was decided that a pressure equivalent to 1,000 pounds to the square inch upon the area of the tube would be ample for all purposes; that is, that no pile could be forced against a like resistance, and consequently when a medium adequate to support that pressure, either from its own density or from the friction and pressure of the superincumbent earth, was reached, a safe foundation upon which to build the docks would be obtained. To exert this pressure on the tube, the tube itself required to be very strong to resist bending when unsupported in the water or thin mud. A wrought-iron tube having an external diameter of $2\frac{1}{2}$ inches and an internal diameter of $1\frac{1}{2}$ inches was selected. The tube was made in sections of 8 feet, the weight—about 150 pounds—of each piece being as great as could be easily handled. The tube was secured to a cross-head by a contrivance which, while holding the tube securely, would permit it at the same time to be turned around. At each end of this cross-head a piston-rod was secured, the piston to which each rod was attached moving vertically within a cast-iron cylinder of six inches diameter, and long enough to allow a stroke or movement slightly greater than the length of a section of the boring-tube.

These cylinders were supplied by means of a steam pump, of the type known as fly-wheel pumps.

A boiler of the vertical type was selected to supply steam for the pump.

A simple arrangement of pipes connected the pump with the hydraulic cylinders, and the attendant, by the action of a single lever, could instantly stop or reverse the movements of both pistons. A float or scow to carry this machinery had to be provided; it was desirable to have it as small as possible for facility of handling in crowded slips, while at the same time there must be sufficient displacement to resist the pressure upon the tube and maintain great stability at all times. The larger the area of the water line, of course the less the scow would lift when the pressure was applied. The pressure

In the original design the tube was attached to a loose head passing through the cross-head, but at the suggestion of Major Watson an arrangement was designed by which the tube was allowed to pass through the cross-head, and was clamped below; by this means, when there was needed a total length of not more than 32 to 48 feet of tube, the tube could be used without uncoupling; after the pistons had descended the full stroke, the tube was unclamped, the pistons raised, and at their full elevation the cross-head was again clamped to the tube.

In order to prevent one piston traveling faster than the other and thus springing the tube, the piston rod at the cross-head end was made T shaped, and at the end of each arm of the T a hole was bored, somewhat larger than the bolt which passed through and secured them to the cross-head. By this means, if one piston should advance beyond the other, the strain from the inclination of the cross-head would be thrown on the outer arm of the T on the slower piston; and on the inner arm of the faster one, thus giving a leverage in favor of the slow piston; this was found to work very satisfactorily.

In order to regulate the pressure employed in forcing the boring tube down, a safety valve was provided having the usual weighted arm; by moving the weight any force desired could be brought to bear upon the tube; and during the test before the acceptance of the machine a pressure of 450 pounds to the square inch, in the hydraulic cylinders, was carried, equivalent to a total pressure downwards of 23,850 lbs., which would be 3,674 lbs. to each square inch of the boring tube.

In describing the means of connecting the tube with the cross-head it was stated that it was so devised as to permit the tube to be turned; the object of this was to enable the person in charge of the work to ascertain, when the further progress of the tube was checked, the character of the material against which it bore.

The lower end is provided with an auger bit forged of heavy steel, and a sample of the last ground entered generally adheres to the underside of the shoulder of the bit.

In operating the machine the cross-head is first raised to the extreme elevation, and as much of the tube is connected and passed through the guide-hole as will enter without pressure; it is then further forced down until the strength of four men can force it no further by pulling upon it with their hands. At

It is not claimed for this machine that the strata can be so accurately defined as by the usual boring-rod, where the apparatus can be stationed upon a firm foundation; but it is claimed that, where borings are needed to establish the depth to which piles must be driven, or foundations carried down for piers of wharves, bridges or other structures, all the data necessary can be obtained by this machine in much less time, and at far less cost, than by the use of boring-rods. The amount of pressure required, and the sound transmitted through the tube when turned, show, with considerable accuracy, the nature and extent of the strata through which the tube is forced, as shown in the profile of soundings south of Pier 1, North River; where, overlying the rock, is a bed of stiff mud, over which is a layer of gravel, and above this a later deposit of mud. The point at which the tube met the surface of these various deposits was shown by the difference in the pressure required, and the depth at once read off and recorded.

The Size of Boilers as Affecting Economy of Fuel.

HANNIBAL, Mo., July 20, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I desire through your columns to correct a statement made at the American Railway Master Mechanics' Convention at Boston concerning the size of boilers. The size given should have been 45 inches instead of 35 inches. The economical use of fuel is not so much due to the difference in the size of boilers, between 45 inches and 48 inches, as to the difference in the size of the fire-boxes in the two engines referred to. The locomotive with the 48-inch boiler has a box about 6 inches longer and 5 inches deeper and from 8 to 12 more 2-inch tubes than the one having the 45-inch boiler. The difference in the consumption of coal in these two engines will average about 8 miles to one ton, tonnage of load and other things being equal.

H. A. TOWNE,

General Master Mechanic Hannibal & St. Joseph Railroad.

THE MASTER MECHANICS' ASSOCIATION.

Official Report of the Fifth Annual Convention.

(Continued from page 307.)

On motion of Mr. HAYES, Illinois Central Railroad, Mr. COLLEMAN SELLERS, of Philadelphia, an associate member, was invited to read a paper, as follows:

ON THE SELF-ACTING SLIDE LATHE.

In compliance with the request to furnish a paper to be read before the American Railway Master Mechanics' Association at its meeting in Boston, it has occurred to me to present a few thoughts on the theory and construction of that important machine, the self-acting slide lathe.

Prominent in the list of tools for the equipment of the workshop stands the lathe. It was the first machine tool, it is the most important. Upon it has been expended much thought, and about it has been much written. My excuse for treating of it is, that during the past few years the lathe has been much improved. Its functions have been carefully studied and its form changed to agree with the now better known theory of its operation. Traditional shapes and devices have been discarded, and new ones are becoming familiar to the men who use the lathe.

It must be conceded that the requirements of a good turning lathe are: that it must turn a true circle; it must turn a true cylinder; and it must, when facing off, produce a true plane surface. The screw-cutting lathe must, in addition to these requirements, produce a sufficiently perfect thread. It is not only necessary that the lathe should fulfill these requirements when new, but it should continue to do so year after year with the least possible need of adjustment or repair.

It has been said that good workmen can do good work with poor tools. Skill and ingenuity may indeed accomplish great results. The problem of the day, however, is not only how to secure more good workmen, but how to enable such workmen as are at our command to do good work, and how to enable the many really skillful mechanics to accomplish more and better work than heretofore. In other words, the attention of engineers is constantly directed to so perfecting machine tools as to utilize unskilled labor.

The turning lathe, being the oldest of all machine tools, has been more hampered by traditional devices and shapes than more recently contrived machines. Changes for the better have to be made, often in opposition to the prejudices of the workmen. This opposition has not, however, deterred engineers from steadily improving the machinery they design, as new uses and new requirements seem to demand a change. Much more is required of the turning lathe now than was thought of a few years ago. More and better work must be done by it with less skillful workmen, and it must be adapted to the various kinds of work required of it in particular kinds of manufacturing. Thus many lathes adapted to special purposes have been designed and designated by the name of the classes of work they are intended to accomplish. Through all the various forms of lathes there are certain parts and principles in common, and these parts and principles may be considered, without treating of special or unusual forms. Certain general types of parts of lathes have become as well known by name as any other familiar objects, and mechanics can readily understand the characteristics of these peculiarities when brought to their notice by name only.

Thus to speak of a lathe shear as a "V shear," or a "flat top shear," conveys to those for whom these remarks are intended a sufficiently clear idea of the two principal forms of the lathe-bed or shear now in use. The V shear has been the favorite in this country for many years; the flat-top shear is the rule, not the exception, in England.

In view of the well-known fact that durability of machinery is largely dependent upon extended surface, when surfaces move or slide one on another, it is rather surprising that the flat-top shear should have met with so little favor in this country up to quite a recent period. Theoretically, it presents the largest wearing surface and is the most easily made. The saddle of the slide rest, bearing over its whole surface, may find a support up to edges of the center opening into the V shear. Having less distance to span unsupported than on the V shear, the saddle may be made thinner and yet strong enough, thus increasing the capacity of the lathe swing over the slide rest. On lathes with V guides, there are usually four of these guides, the two outer ones serving to guide the saddle, and the saddle must of necessity span the entire space unsupported from one V to the other, hence must be thicker and heavier than if resting on a plane surface. The nominal capacity of any lathe is what it will swing over the shear, the actual capacity for cylindrical work being what it will swing over the slide rest. Hence the advantage of less thickness to the saddle if of sufficient strength. With less thickness is consequently less weight to be moved—an important consideration on large lathes and worth considering on the smallest. The extended surface prevents rapid wear. The flat surface is no more apt to catch dust than the Vs are, and the chips are as readily pushed aside by the saddle. That the shear surface must not be allowed to become gummed up and dirty from neglect, is a merit rather than a disadvantage.

The flat-top shear surface can be readily planed true on its upper face, on its outer edges, and on its inner edges. The outer edges guide the saddle, lost motion being taken up by shoes or gibbs. The lathe heads are guided by the inner edges. The parallelism of all the edges can be readily insured. Convenience in moving readily requires the poppet or back head (which in the flat-top shear is guided by the inner edges) should slide easily, and hence should fit loosely. It is of the utmost importance that it shall always hold the same position as to line with the other parts of the lathe when clamped ready for use. This suggests placing a V on the under side of one of the inner edges, and thus, by means of the clamping shoe, draw the head always up to the same straight-edge. I consider this combination of a clamping V on the under side of shear-top with a flat surface above it as one of the most important modern improvements in lathes. The idea originated with Mr. William Sellers, of Philadelphia. It is one of many very advantageous changes made by him, and is the result of many years' study of this important tool.

The functions to be performed by the lathe shear or bed is to maintain the driving head or live-head spindle in line with the poppet-head spindle, and to carry the cutting tool parallel with this center line. It must do this under various conditions of strain. Screwing up the centers to hold the work tends to bend it in one direction; the pressure of the cut tends to bend it in other directions. A clear idea of a number of these strains can be had by conceiving a rigid driving head and a flexible shear submitted to the strain of a heavy cut. The tendency in such a case would be for the driving head to rotate the work to be turned and, by means of the shear around it also; hence a lathe should be able to resist lateral, vertical and torsional strains. The longer the bed the more elastic is it in regard to torsion, unless well supported by cross girts extending up as nearly as possible to the top and forming inflexible ties between the I-beams which represent the sides of the shear.

The lead screw in screw-cutting lathes should be placed within the bed, and, when supported over its entire length by resting in a trough planed out to receive it, is not subject to deflection. Maintaining its right line it will produce a truer thread than if unsupported, except by its nut and end bearings.

By being placed under the shear top, it is entirely protected from falling chips and dirt.

Upon the perfection of workmanship on the spindle of the live head depends its possibility of turning a true circle: upon its freedom from end motion and the exact placement at right angles to it of the line of the cross-slide rest depends the possibility of producing a true plane in facing.

The spindle must be round—truly round—as it will reproduce its own shape on the work being turned.

Theoretically a hardened steel spindle running in hardened steel bearings, the spindle and the bearing being made true after having been hardened, presents the most reliable conditions of correctness and durability. Fortunately modern improvements in methods of working hardened steel furnish means of perfecting this important part of the turning lathe, but to adapt it to the possibility of economical construction some important changes must be made in form. The traditional collars at each end of the journals must be dispensed with and the front journal be made truly cylindrical and supported over its entire length by a truly cylindrical bearing. The back bearing may be conical, and one stationary ring or collar of hardened steel secured to the spindle back of its back bearing may be ground true and be made to run between hardened steel plates without any lost motion, and no liability to stick or jam. This form of back thrust does away with the tail screw, permits a more extended and durable wearing surface, and permits the spindle to be extended through the back support, and to receive change wheels of any size for screw cutting or feed.

The form of the live-head stock should be such as to hold the front bearing in a rigid manner against lateral strains, and the back bearing against a strain of spindle pressed endways.

The cone speeds should be so proportioned to the gearing on back and triple-gear lathe as to ensure an exact ratio of change, from the fastest to the slowest speed, in each and every change. Thus, with five (5) lifts to the cone in a triple-gear lathe, fifteen speeds should be possible, and each proportionally slower than the one next to it. The cone pulley on the spindle should be of iron, turned outside and inside, so as to be perfectly balanced; and its inner cone sleeve should present an extended surface on the spindle, capable of proper lubrication.

The spindle should be made of the best cast steel, roughed out, then hardened and reduced to the proper shape, after hardening, by suitable machinery. The conical hole for the movable center should be finished true, after the spindle is made true on the outside. This hole must be as true as the outside, else the center cannot be put in place so as to be in adjustment. Too much care cannot be taken in the manufacture of this important part of the machine.

Hardened steel spindles have been made in this manner for lathes as large as 48 in. swing, the front bearing of such a lathe being 5 inches in diameter, but practical difficulties in the way of working with safety such large masses of hardened steel prevent its adoption for spindles larger than about three inches diameter.

On all double-gear lathe the face plate should be made to unscrew, for convenience of changing the size and for the ready application of checking devices. The overhanging end of spindle to receive the face plate should have a portion of its length next to the shoulder truly cylindrical, without any screw thread. The screw on end may be made short, and should fit loosely on the face plate, but a very careful fit should be made of the face plate on the plain part of the spindle, and the shoulder against which the hub of the face plate abuts should be made very true. This arrangement insures the face plate always running true, no matter how frequently it is changed or how loosely the screw may fit, provided the fitting parts are not bruised or injured.

I should here remark that spindles made as described have been tested during many years' constant hard usage, and have been found to show no appreciable wear. Possible adjustment of all wearing parts should be provided, but such adjustment should not be at the whim or convenience of the workman using the machine, as is the case with the spindle collared at its journals and provided with a tail screw for the back thrust. I have already mentioned the method of holding the poppet head so as to insure its alignment, by means of the V on the under side of the flat-top shear. Its spindle should be carefully fitted, and a device recently patented by Mr. Faught, with A. Whitney & Son, Philadelphia, is of great service in insuring stability. He clamps the spindle at its entire end of bearing by means of a split conical sleeve forced or drawn in by means of a screw. This takes up all lost motion and insures the alignment of spindle. If lathes were not required to turn tapers as well as cylinders, there can be no doubt that a poppet head made in one piece resting on the shear over a sufficiently broad surface, and capable of adjustment sideways only to the extent of practical alignment, would be the simplest and the best. In our own practice we prefer this system and adapt to lathes requiring it a device which enables the turning tool to be guided by former bars, and thus to produce conical or irregular shapes. This device, called technically a former attachment, does better work of this character than when the centers are set over out of line, for reasons too obvious to all mechanics, and gives a greater range to its capacity.

I may be pardoned for mentioning in this relation what I consider the readiest method of bringing the centers in line after the back head has been set over out of line, in adjusting the centers in the first place or in testing the correctness of a new lathe. A bar of round iron, carefully centered, is turned up a short distance on one end. This turned end being placed next the live-head center, a turning tool clamped to the slide-rest is made to just touch the turned part. Taking out the bar, the tool is moved to the poppet-head end of lathe, and the bar replaced with its turned end next to the poppet-head center; when, if the tool just touch the turned part as before, the lathe may be considered as in adjustment. A vertical adjustment to the point of the turning tool is of the utmost importance for lathes used for turning work of small diameter. The larger the diameter of the work to be turned, the less need there is of such adjustment; in other words, the more latitude there may be in the positions of the tool point. Lathes of 16 in. swing and under should be provided with some means of raising or depressing the point of tool. Larger lathes, when the rests are compounded, may dispense with this. The feed for turning should be independent of the feed for screw-cutting, and the changes of speed to the feed for turning should be capable of graduation to suit the nature of the work between the extremes of speed.

When, as is often the case in large lathes, an automatic cross-feed is provided, it should be stopped or started by the same motion and the same starting gear as puts in operation the longitudinal feed, but the adjustment to set feed should be made by a separate device. Workmen can accomplish more if they have not too many possible movements to think about, and as in the ordinary movements of this character they are movements of habit, the devices to accomplish any change of feed should not be of a nature either to confuse the workman or to render an accident by use of wrong feed possible. All sliding surfaces of the slide-rest should be so made as to be protected from falling dirt and dust. This is of the utmost importance, and too often neglected by makers of otherwise good lathes. For lathes of up to 36 in. swing the very convenient single-screw tool post can be used to advantage, but for larger lathes it is not possible to hold the tool in this way alone, if the larger are proportionately powerful. Four screws or standing bolts, with clamping bars, as on the apron of planers, answer a better purpose and admit of greater range of positions.

What I have thus presented in relation to the prominent features of the self-acting slide lathe is in reality the result of many years' observation and study of this important tool by some of our best engineers, and noted by me in a somewhat extended familiarity with the tool, both as a workman and a designer. The turning lathe, as of all other machines, should not be made up of conventional forms and devices, without any good argument to recommend their use. It should be capable of analysis, and each and every part should be constructed with a view to the end to be obtained. Working men soon appreciate the advantages of such tools when used to them. Railway master mechanics have better opportunities of examining into the merits of machine tools than many others, and are ever the readiest to appreciate improvements. It is with great pleasure, therefore, that I present these observations to them, and hope they may at least suggest thought, and aid them in their inquiry into the merits of tools so constructed.

Mr. TOWN, Hannibal & St. Joseph Railroad, moved that a vote of thanks be tendered to Mr. Sellers for the interesting and valuable paper prepared and read by him, and that it be placed on file. Carried.

The report of the Committee on Finance was then presented, as follows:

REPORT OF COMMITTEE ON FINANCE.

BOSTON, June 12, 1872.

To the Members of the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee upon Finance have examined the accounts of the Association as shown upon the books of your Secretary and Treasurer, and beg leave to report:

Amount received by Treasurer.....	\$1,470 00
Amount paid by Treasurer.....	1,411 35
Amount in hands of Treasurer.....	\$58 65

as shown in his report.

Amount received by Secretary.....	\$25 00
Amount paid by Secretary.....	86 26

Total due to Secretary.....	\$61 26
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Total amount received by Secretary and Treasurer.....	\$1,495 00
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Total amount paid by Secretary and Treasurer.....	1,497 61
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Total amount due Secretary and Treasurer.....	\$2 61
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Total amount due the Association from delinquents on last assessment.....	\$421 00
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Total indebtedness of Association.....	2 61
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Total cash assets due Association.....	\$418 39
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Less outstanding bill for printing, estimated at about.....	\$50 00
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We would suggest to those members of the Association who have been negligent in paying their dues, that it is of the utmost importance that they should do so at once, as the current expenses of the Association must be met and each member should feel the importance of each bearing his own share. We also recommend that the usual assessment of \$1.00 from each member be made to meet the current expenses of the ensuing year, and a committee be appointed to-day to secure the same.

Respectfully,

H. M. BRITTON,
JAS. SEDGWICK,
MORRIS SELLERS,
JAS. M. BOON,

Committee.

On motion of Mr. HAYES, Illinois Central Railroad, the report was accepted, and a Committee on Assessment ordered.

Mr. HAYES, Illinois Central Railroad—We have not been able to go through all the correspondence, but there are four which we recommend that the Secretary read to the Association.

A communication was read from J. H. Coyne, offering to each member of the Association a copy of his "Railway Annual." The offer was accepted.

An invitation was received from the custodian of the Masonic Temple to visit that elegant building and inspect the various apartments. The invitation was accepted, and the thanks of the Association returned therefor.

Communications were also received from Henry Morton, of Hoboken, N. J., inviting the members to visit the Stevens Institute of Technology at that place, and from the Superintendent of the Boston & Maine Railroad, tendering free tickets to such of the members as might desire to visit any of the stations on that road. The courtesies were accepted, and the Secretary directed to return the thanks of the Association to the gentlemen.

The report of the Committee on Subjects for Consideration at the Next Meeting was then read, as follows:

REPORT ON SUBJECTS FOR CONSIDERATION AT NEXT CONVENTION.

BOSTON, June 12, 1872.

To the President and Members of the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee appointed to propose subjects for discussion for the ensuing year suggest the following for your consideration:

1. Locomotive Boiler Construction.
2. The Operation and Management of Locomotive Boilers, including the Purification of Water.
3. The Comparative Value of Anthracite Coal, Bituminous Coal and Wood for Generating Steam in Locomotives.
4. The Construction, Operation and Cost of Maintaining Continuous Train Brakes.
5. The Relative Cost of Operating Roads of Gauges of 3 ft. 6 in., or less, and those of the Ordinary 4 ft. 8 in. Gauge.
6. The Construction and Operation of Solid-end Connecting Rods for Locomotives.
7. Resistance of Trains on Straight and Curved Tracks, and on Wide and Narrow-gauge Roads, and of Four or Six-wheeled Trucks, and with Long and Short Wheel-base.
8. The Efficiency of Check or Safety Chains on Engine, Tender and Car Trucks in Lessening the Danger Resulting from Running off the Track.
9. The Machinery for Removing Snow from the Track.
10. The Machinery and Appliances for Supplying Fuel and Water to Locomotives.
11. The Machinery and Appliances for Removing Wrecks and Erecting Bridges.

Your Committee also recommend for consideration by the Association the advantages which would accrue from offering two premiums of — dollars each for the best design and drawing of machinery for accomplishing the two last-named operations.

J. M. BOON,
M. N. FORNEY,
P. J. PERRIN,
W. A. ROBINSON,
W. B. SMITH,

Committee.

On motion, the report was accepted, and the committees ordered.

Mr. CHAPMAN, Cleveland & Pittsburgh Railroad—There is one subject that I would like to have added: The best form and proportion of axles for cars and locomotives; also, whether there is anything to be gained by the use of combination axles and loose wheels. Carried.

Mr. ROBINSON, Great Western Railway—During the meeting of our committee yesterday, we had a very long and warm discussion on the subject of a fund belonging to this Association for the trying of experiments, but we could make very little headway with it, because we did not know what the general opinion would be in regard to this subject. I might go on and explain for half an hour the many vexed questions which worry

and annoy railroad superintendents and master mechanics every day of their lives; the innumerable patents which are brought to their notice, the merits of which it is very difficult to discover, and also the various improvements which require an actual test before any truthful result can be ascertained, but whose cost would be too great for one road to undertake. The gist of the whole thing is this: that it seems a great waste of money and brains that every road should try each of these experiments, starting at the same point and coming to the same result. It seems to me if some plan could be devised by which the railroads should appropriate a certain sum, in proportion to their capital or mileage, the master mechanics could each year, at this Convention, put these experiments into the hands of committees, and some good result would follow. The ideas conveyed to our minds were such that we did not feel that we were in a position to make any recommendation, but it is a matter well worthy the consideration of this Convention, as a great saving of labor and brain-work.

AMENDMENT TO THE CONSTITUTION.

Mr. SETCHEL, Little Miami Railroad—I have been handed the following amendment to Art. 4, Sec. 2: Strike out the word "one" and insert "two," in the last sentence.

A MEMBER—What is the object of making this amendment? Mr. HAYES, Illinois Central Railroad—The object is to get more talent into our Association than we have at present. In a multitude of counsellors we can always arrive at better conclusions. There are a great many mechanical engineers in the country who would like to become members of our Association, who, perhaps, could do us a great deal of good, and, perhaps, we could do them a great deal of good.

Mr. SETCHEL, Little Miami Railroad—It seems to me as I read that article, it covers all that it will when this amendment is made: "Also, one mechanical engineer or the representative of each locomotive establishment in America." It seems to me that if the particular man who came from a locomotive establishment last year cannot come this, they can send a representative.

Mr. HAYES—They can send but one; it is proposed that they be allowed to send two.

Mr. SETCHEL—I cannot see the object in having two from one locomotive establishment.

Mr. HAYES—It will be better represented. One individual or corporation may employ a dozen master mechanics and each one of them may become a member of the Association.

Mr. SETCHEL—That is true, and each one has his special duties to attend to; but I cannot see that there is anything peculiar about a particular locomotive establishment that should make it necessary for more than one man to represent it.

Mr. HAYES—The locomotive establishments have the best talent in the country, and some of them may have as many as five or six mechanical engineers. If we can get the talent of two in the place of one, is it not better?

Mr. ROBINSON—A locomotive establishment can have the superintendent and general foreman members of this Association, as the rule now reads.

Mr. HAYES—Only one. If the locomotive foreman is on the rolls, then the superintendent cannot be. The foreman on a road can come in if he is recommended by his superior officers.

Mr. ROBINSON—That gives two for a shop.

Mr. HAYES—As many as may be in the shop.

Mr. SETCHEL—As Mr. Hayes represents it, it is not to secure one representative from an establishment, but two.

Mr. HAYES—If they wish to join.

Mr. SETCHEL—The section provides already for a representative; if one cannot come, they can send another. I should like to know if they have not the right to send representatives.

The PRESIDENT—If the representative sent first signs our constitution, he has the right to come; if he cannot come he cannot send anybody else.

Mr. HAYES—Dr. Williams, as I understand it, is on our rolls as the member from the Baldwin Locomotive Works. Dr. Williams is a member of this Association, and no other man, as I understand it, from the Baldwin Locomotive Works, can be a member. One object in bringing the amendment forward was that Mr. Baird, an old locomotive builder, whom I have known from a boy up, might become a member. He would be an ornament to the Association.

The amendment was adopted unanimously.

REPORT ON PURIFYING WATER FOR BOILERS.

To the American Railway Master Mechanics' Association:

GENTLEMEN: At the last annual meeting, pending the discussion of the report of the Committee on Boiler Incrustation, Mr. Hayes said: "To bring this thing to a point, I offer the following resolution:

Resolved, That the Secretary be authorized to correspond with superintendents and master mechanics of railroads where water of impure quality is largely used, with a view to experiment upon the process recommended by Mr. Hayes or some others for purifying water, the result to be reported by Secretary at next annual meeting."

On motion, this resolution was unanimously adopted.

In the opinion of your Secretary, it would have been entirely proper to have referred this to the Committee on Incrustation, inasmuch as it grew out of their report. And this subject had already been taken up by the Committee and discussed at some length; but, being greatly troubled with the results of impure water, and not wishing to appear negligent in duty, the Secretary had three hundred of the following circulars sent to the different master mechanics of the country:

"DEAR SIR: At the last annual meeting of the American Railway Master Mechanics' Association, the report of the Committee on Boiler Incrustation demonstrated very clearly that by far the largest repairs on locomotive boilers were caused by the use of impure water. In some sections of the country the water is impregnated with lime and other minerals that attack the iron along the seams, around rivet and bolt-holes, and wherever the grain of the iron has been disturbed in process of manufacture, frequently making it necessary to renew certain portions of the boiler in two or three years, and flues in a year or eighteen months; while in localities where the water is pure or free from the injurious properties, we have reports of boilers lasting in good condition from twenty to thirty-eight years. These being the results of using pure water, it is easy to see what a vast amount of money, to say nothing of the loss of the use of machinery, would be saved to railroad companies if all could procure good water.

"With this view, the Secretary was instructed to correspond with superintendents and master mechanics in regard to purifying the water before it is allowed to enter the boiler, and report at the next annual meeting of the Association. And in order to make this as full and practical as possible, he respectfully asks the benefit of your experience and opinions.

"1st. Is it in your opinion practicable to so use the exhaust and waste steam at water stations where steam power is used for pumping to heat the water to such an extent as to precipitate the lime and other impurities that are injurious to boilers, so as to render it practically pure?

"2d. If such a result could be obtained, would not the expense saved in fuel and repairs of boilers justify the adoption of such a practice, even at an increased expense of pumping power?

"3d. Have you had any experience in heating the feed water of boilers for the purpose above named, and if so, with what result?

"4th. Can you suggest any device for heating the water at water stations that would not be expensive, and at the same time, accomplish the desired object?"

Out of twenty-six answers returned, thirteen do not believe it practicable; eight assign as a reason the impossibility of heating so large a quantity of water as would be necessary at important stations where steam power would be likely to be used for pumping water, and five that it cannot be accomplished to any extent in any quantity short of distilling or evaporating. Among these may be numbered Mr. Van Vechten, of the Atlantic & Great Western Railroad. He reports: "We have experimented somewhat in this matter. In a tank 16 feet high by 13 feet in diameter a 2-in. worm pipe was placed to the full depth of the tub and live steam used to heat the water. But we were unable with a consumption of 3,000 lbs. of coal every twenty-four hours to heat the quantity of water used during that time—about 26,000 gallons—enough to make any perceptible difference in the appearance of boiler or flues of an engine which used this water exclusively, and of those that used it once a day or not at all. The kind of boiler used for making the steam was of the locomotive pattern, with iron flues 3 inches in diameter and 8 feet long. The fuel used was soft coal." Mr. Van Vechten does not state the degree of heat obtained in the water in this experiment, which would be very important in deciding the question as to whether anything short of distillation will accomplish the much-desired object. Mr. Skidmore, of the Louisville Short Line, reports heating the water used in stationary engines at shops to an average of 168 deg., but receiving no special benefit therefrom, except the saving in the daily consumption of fuel, the scale forming on the flues and inside of boiler from 1-16 to 1-10 inch thick in a few months. This statement coincides with the experience of your Secretary, who has for a number of years used a heater for the purpose of heating the feed-water of stationary engines at the company's shops, and obtained an average temperature in feed-water of 170 deg., but without diminishing the accumulation of scale to any perceptible degree.

H. G. Brooks, President of Brooks Locomotive Works, a man of large experience in all the departments of railroads, writes: "In my opinion it is impracticable to employ exhaust or waste steam for the purpose you suggest, for the reason that you will by no means succeed in precipitating the impurities of the water to any practical or valuable extent, except by entirely evaporizing, and afterwards condensing it. Any less thorough method than this, if heat alone is to be the agent employed, will fail to give satisfactory results. I do, however, believe that if pure water can be obtained it will result, not only in greater economy, but greater security. My advice to the Association would be to secure the service of a chemist, the most skillful and competent the country affords, and by repeated and carefully instituted experiments determine the most economical chemical agent or agents necessary, and competent to neutralize or precipitate the impurities of the water and the expense attending the process on a large scale. Then the question of economy will be a very simple problem to solve."

Mr. Griggs, of the Oswego Midland, reports: "I do not think the impurities can be taken out of water except by condensation." Mr. Ham, late of the New York Central, reports: "I think it advisable to use any means that will enable us to procure pure soft water for boilers, but I do not consider it practicable to get the impurities out of water by heating it at stations. I would advise the building of earth reservoirs, and the using of surface water instead. We have a number in use on this road, and they are giving good results."

Of the thirteen who believe it practicable to precipitate the impurities in water at stations by means of heating, the majority answer that they have had no experience except in heating water for use in stationary engines, and for this purpose the result seems to be generally satisfactory, although two cases are reported where no special benefit was derived from the heater, and it was abandoned as impracticable.

Mr. Hayes, of the Illinois Central, reports: "that he is still obtaining good results from the plan proposed by him at the last annual meeting, but has had no opportunity of enlarging his views by any other experiment."

Mr. Towne, of the Hannibal & St. Joseph Railroad, reports: "I doubt whether the exhaust and waste steam of a pumping engine would heat the water sufficiently to precipitate all its impurities, especially at stations where large quantities of water are used. At such stations, however, live steam might be employed to make up the deficiency at a moderate cost. I shall endeavor to show in the next annual report on incrustation the actual saving in repairs and fuel by the use of pure water; also the extra cost of purifying water by the above process before it is taken into the boiler." This will be of vital importance to the Association in securing the attention of those higher in authority to this subject. Master mechanics have had the conviction forced home that impure water is the bane of good boilers, but superintendents and presidents do not so readily see or appreciate its importance. Said a master mechanic in writing to the Secretary on this subject: "You will find it very difficult to convince by argument our railroad managers that by making a sufficient outlay to obtain pure water for boilers, it will prove a source of revenue in years to come. You will be met with the reply that these are visionary theories; but if you can suggest a plan whereby they can turn a penny in thirty days, you will secure a patient hearing." In conclusion, the Secretary desires to tender his thanks to the President of the Association, Mr. Britton, of the White Water Valley Railroad; Mr. Chapman, of the Cleveland & Pittsburgh Railroad; Mr. Robinson, of the Great Western of Canada; Mr. Thompson, of the Eastern Railroad of Massachusetts; Mr. Coolidge, of the Fitchburg Railroad; Mr. White, of the Evansville & Crawfordsville Railroad; and a number of others, for the full replies sent to circulars, and which have not been mentioned in this report. It has been the aim in making up this report, to give the opinions and experience of those who have practically tested the matter under consideration, leaving it for the Association to draw its own conclusions. All of which is respectfully submitted.

J. H. SETCHEL, Secretary.

On motion of Mr. Hayes, the report was received and placed on file.

Mr. HUDSON, Rogers Locomotive Works—The subject of avoiding incrustations is a very important one as regards not only economy of fuel, but wear and tear of boilers. No statement is required from me on that subject; we all know it; but the important point is, how we shall accomplish it. I gather from that report that it is thought that if we succeed in obtaining pure water we shall accomplish all we desire. I apprehend that that is a mistake; that while pure water will prevent any deposit of sedimentary matter, it will increase the chemical action and hasten the destruction of the material of the boiler to a very great extent. Indeed, I may state, that our steamships crossing the Atlantic have found the substitution of entirely pure water for impure water in their boilers an impracticable thing. In other words the destruction of the boilers with pure water was so great, that they were compelled to introduce a portion of impure water, to prevent the chemical action of the water and the destruction of the boiler plates. What we want, in my estimation, is, to have an analysis made of the water, and understand what the impurities are, and discover something which will keep those elements in solution, so that we can get rid of them either by blowing off at the surface of the water or at the bottom of the fire-box. But I apprehend that a great deal of the sedimentary or other matter may be got rid of by a proper use of the surface blow-off. We all know that where impure water is used these sedimentary matters come up from the bottom during the action of the boiler, and if we had some ready means of collecting them and blowing them off, so as to keep them from depositing and attaching themselves

to the plates, we should accomplish all we are after. While it is desirable to prevent the deposit of sedimentary matter, I must say I have no faith in doing it by obtaining absolutely pure water. I think we make a mistake when we set that down as a point that is desirable to be gained.

Mr. SETCHEL—These other papers on incrustations are so closely connected that I would suggest that they be read before the discussion proceeds.

Mr. TOWN, Hannibal & St. Joseph Railroad—I would suggest that the Report on Incrustations be postponed until to-morrow morning, if there is any other business that can be done to-day. We have now only one hour; it will take nearly that time to read the report, and it will be forgotten by the morning and have to be read again.

This suggestion was agreed to and the report postponed.

COMMITTEE ON ASSESSMENT.

The PRESIDENT announced as the Committee on Assessment, Messrs. H. A. Towne, Hannibal & St. Joseph Railroad; H. Fry, Grand Trunk Railway; and B. H. Kidder, Lake Shore & Michigan Southern Railway.

ASSOCIATE MEMBERS PROPOSED.

Mr. HAYES, Illinois Central Railroad, proposed the names of F. B. Miles, of Philadelphia, and Prof. R. H. Thurston, of the Stevens' Institute of Technology, as associate members. They were recommended also by W. A. Robinson and R. Wells.

The proposition was referred to a committee consisting of Messrs. Philbrick, Maine Central Railroad; D. Clark, Lehigh Valley Railroad; and J. L. White, Evansville & Crawfordsville Railroad.

Mr. SELLERS—Mr. Stevens, the founder of the Stevens' Institute, was a mechanical engineer of a great deal of merit and ability, and it was his wish, all his life long, at some time or other to found an institution which should teach purely mechanical engineering. That institution now stands as the only one in the United States devoting itself exclusively to the teaching of mechanical engineering; and with President Morton at the head of the institution, and with Professor Thurston as Professor of Mechanics, I think it is likely to become a great success. I am satisfied that mechanical engineers can at any time make it available to their own use, by applying to these gentlemen, and having experiments tried within the walls of this institution, by the professors, who will do it gladly, upon any questions which it may be important for them to determine. The number of instruments and the means they have for determining questions of great scientific interest, enable them to do it, probably, better than any other institution in the country.

The PRESIDENT—We will now have the report of the Committee on

LAP AND LEAD OF SLIDE VALVES.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee on Lap and Lead of Slide Valves and General Principles of Valve Motion would respectfully submit the following:

Your Committee have received replies to the following questions from 33 roads:

With locomotives running fast passenger trains, with locomotives running passenger accommodation trains, with locomotives running heavy freight trains, what amount of outside and inside lap, what amount of travel of valve, what amount of lead in full and half gear do you use?

Upon comparing the replies with the report of the Committee of 1870, we find that no additional information on the subject has been received; consequently, we deem it unnecessary to duplicate that report.

In regard to balance valves and valves working on rollers, the Committee have received reports from nine roads which have used rollers. Six have taken them out, and the other three give no result of their performance. Eight roads have reported using balance valves of different makes, with good results. One of these valves is reported as saving 60 per cent. in wear of valve gear, on one road; a valve of the same make was tested on another road with apparent good results, but, on making the balance inoperative, the engine worked as well as when the balance was supposed to be effective.

It is impossible for your Committee to go into a detailed report of a subject which involves so many questions of expansion of steam, economy of fuel, grades, rate of speed, weight of trains, etc.; therefore they would respectfully ask to be relieved of its further consideration.

DAVID CLARK,
H. D. GARRETT.

On motion of Mr. ELLIOTT, Ohio & Mississippi Railroad, the report was accepted.

Mr. FRY, Grand Trunk Railway—I have had some little experience with balance valves for the last two years, and it seems to me a matter of very great importance. It is a matter which has not been experimented upon very largely, but is coming into favor with certain master mechanics; and I think it would be very valuable for the general railway practice of the country to have, from year to year, the various master mechanics, who are trying balance valves, report in our journal their experiments with the valves they are trying, so that we should from year to year ascertain what valves are failing and what succeed. I think we might do this without favoring any particular manufacturer. I think we could trust each other sufficiently to know that they would report favorably upon nothing that was not really good. The success we have met with the road I represent has been thus far so good that I think it would be found to be a very important matter by those who should try it. I think it is a matter well worthy still further experiment, and I would suggest that the results of any experiments be sent to the Secretary, to be published in our next report.

Mr. LAUDER, Northern Railroad—I fully agree with my friend, Mr. Fry, in regard to this subject. I look upon this matter of balance slide valves as being of great importance, more especially on roads burning coal. I think, in order to carry out Mr. Fry's suggestion in a proper way, it would be better to have a committee appointed for this purpose. I noticed in the report of the Committee that there was no recommendation made for a Committee on Valves. I think, as the valve is a very important part of the locomotive, in fact, the life of the locomotive, that it will be necessary and eminently proper to have a committee appointed on valves and valve motion and the whole subject.

I have had some experience with balance valves. I failed to get a circular from the Committee the past year; I was sorry for it, as I wished to give them my experience. I have at the present time ten balance valves running and with great success. I have run one of them for four years last February, and have not been obliged to face the seats of the valve or do anything to it up to the present time. I think that a valve which will do that should be brought into notice by the Committee. I move that a committee be appointed on the same subject, to report next year. Carried.

Mr. FORNEY, of New York—I should like to call attention to the fact that a great many of the reports which have been submitted have drawings accompanying them, to which reference is often made. It seems to me that it would be a good plan to have the drawings engraved and printed with the report. They would not be very expensive. I suppose our Treasurer would be able to tell us whether there is money enough that could be appropriated for this purpose.

Mr. WELLS, Jefferson, Madison & Indianapolis Railroad—I would like to ask Mr. Forney if he knows about what it would cost to engrave such drawings as ought to go in. He is some-

what posted in the matter, and perhaps can give a better idea than any one else here.

Mr. FORNEY—I have not examined them with reference to making an estimate, but I should think they could be engraved so as to accomplish the purpose aimed at for about \$250. It is a rough estimate.

Mr. HAYES, Illinois Central Railroad—I have a model here which has been presented by a gentleman—"A. C. Anson's Double-Acting Slide Valve"—from the Evansville & Crawfordsville Railroad. It is a new idea to me. Mr. Hudson says, however, that he used it twenty years ago. It is said to have worked on that road with very good results.

The next report read was that of the committee on the question

IS THERE ANY MATERIAL OR DEVICE FOR PACKING STUFFING-BOXES MORE ECONOMICAL THAN HEMP?

To the American Master Mechanics' Association:

Your Committee on Packing for Stuffing-Boxes present the following as their report:

They have replied from over thirty roads, the great majority of which prefer hemp. Some prefer hemp and soap-stone, a few soap-stone for pistons and valve rods, and but two think that metallic packing is cheapest.

First, in regard to hemp, it takes a high degree of heat to char it enough to harden it, more than can be by any possibility ever be done by steam. Steam at a pressure of 150 lbs. per sq. in. has only a temperature of 343 deg., while hemp will stand easily 500 deg. With worn rods, and stuffing boxes screwed up tight at worn places, friction sufficient to heat hemp to the charring point might be created. This disadvantage attaches to all kinds of packing, and is due to want of skill and judgment on part of engineer. Hemp has the advantage of always being ready and requiring no special tools to prepare it for use nor any particular size of stuffing-box, and can be used as well by the unskilful as the skilled man.

Soap-stone of various kinds gives good results, and has its advocates, who say that its first cost over hemp is counterbalanced by its longer use and less friction, consequently wearing the valve-rod less.

Metallic packing has been tried by nearly all from whom your Committee received replies, and its use abandoned by nearly all, the result not bearing out its first cost and repairs needed. A great variety of patterns are mentioned, some depending on skill and judgment of engineer, others self-acting by springs or pressure of steam admitted outside of rings and closing them on rods. Wear of rod and consequent leaking of steam seem to be the principal objection.

An earnest endeavor to lighten the labor of engineers, as well as to economize, impels the trial of these various kinds of packing. It is not to be expected that results will be the same on every road. Sandy roads cannot give the same as those that are not sandy, nor unballasted as ballasted, nor can engines on heavy slow freights the same as those on fast passenger. When men of little skill or experience cannot get the same work from an engine as those of superior skill and more experience, is it to be expected that results from use of packing requiring such delicate adjustment as some of it does, will be the same? Improvements have to be introduced slowly and carefully, and men accustomed to their use before they can be expected to be successful; one failure ought not to condemn it, especially when circumstances are against it. These remarks are merely incidental, and brought out by the fact that such a diversity of results from trials under similar circumstances are brought to the notice of your Committee by the replies received. Your Committee would recommend the continuance of the subject another year.

L. H. SELLARS,
F. A. BISSETT,
J. U. EASTMAN.

The report was accepted.

Mr. HAYES, Illinois Central Railroad—I propose Professor Henry Morton, of the Stevens Institute, as an associate member. The recommendation was indorsed, also, by A. H. De Clercq, Toledo, Peoria & Warsaw Railway, and W. A. Robinson, Great Western Railway, and the matter referred to the committee previously appointed.

The Committee on a "Uniform System of Computing Mileage of Engines doing Switching Service," then submitted their report, as follows:

REPORT ON COMPUTING MILEAGE OF ENGINES DOING SWITCHING SERVICE.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee on Uniform System of Computing Mileage for Engines doing Switching Service, appointed at your last meeting, beg leave to report that in answer to the circular issued by them they have received replies from thirty-two superintendents of motive power and master mechanics, representing nearly all the principal lines of railway in the United States and one in Canada, and from them we find that three of these lines compute mileage for engines doing switching service exclusively at the rate of 10 miles per hour for the time that the engines are in actual service; three at 8 miles per hour; three from 6 to 7 miles per hour; fourteen at five miles per hour, and the remainder less than 5 miles per hour; while for engines running local freight trains where more or less switching is done at stations along the line, one of the leading lines of the country allows 24 per cent. in addition to the train mileage, or length of division, to engines running their local freight; one line 11 per cent. addition; five 10 per cent.; one 9 per cent.; two 7 per cent.; sixteen from 6 to 24 per cent.; and five make no allowance at all for switching to engines running local freight.

Your Committee believe that it is a matter of greater importance that there should be uniformity in the computation of mileage for switching than whether the rate per hour or the per cent. allowed is precisely the mileage made or not, so that all roads compute alike.

Where there is so wide a difference in the computation as between 24 per cent. of the total mileage of engines running local freights on one line, and 24 per cent. to that of those doing the same kind of service on another line, no correct estimate as to the relative cost of repairs and of fuel consumed, taking the mileage as a basis of calculation, can be made. The same is true with engines engaged in switching exclusively. One line allowing eight miles per hour for every hour that the engine is on duty; while another line, where the service is the same, allows only five miles per hour. In order that the monthly sheet published by the different roads, giving the cost of repairs and of fuel and other expenses per mile run, may be of value in making comparisons, it is absolutely necessary that all roads should compute mileage alike.

The same difficulty is experienced in other matters; as, for instance, where the cost per mile for repairs is given. One line may have had two, three, or more old engines that were worn out, condemned and consigned to the scrap heap, or sold during the year; while a new engine was built or bought to take the place of each of the old engines so disposed of, the entire cost of such new engines being charged to new machinery; while the same thing taking place on another line, the cost of such engines, or proper proportion of it at least, is charged to repairs of engines, as it should be; and on this account the cost per mile for repairs on these two roads will materially differ, when in reality there should be no difference. The difference (if any) between the value of the new engines that take the place of the old, and the value of such old engines when they were new only should be charged to the account of new machinery; the balance is simply making good the old engines worn out—keeping up the stock.

We find also on some roads an account headed "stores" is

kept separate and apart from that charged to repairs of engines, and that the account in many cases equals one cent per mile run; while on other roads no such account as "stores" is kept, but the supplies charged as "stores" on the one are charged to repairs of engines on the other. Now for the sake of uniformity and simplicity in keeping accounts, we recommend that no such account as "stores" should be kept, but that all supplies heretofore charged in this account be charged to "repairs of engines," and that to the "oil, waste and tallow" account, the oil used on the engine and tender, in cylinders and head lamp, and the waste used in packing the boxes be charged, and that nothing else be charged to that account.

This part of the subject may perhaps be foreign to the matter intrusted to your committee for investigation, yet it seems so intimately connected with it that we desire to call the attention of presidents, superintendents and master mechanics of the different railways to the matter, and urge upon them the necessity of taking such steps as will insure uniformity in the charges to "repairs of engines," as well as in the computation of mileage.

If this is not done, the monthly or annual reports, as published, will be of no value to any one not familiar with the manner of computing mileage and of keeping the repair account on each particular line, as a means of comparison, and might as well be abandoned, so far as other lines are concerned.

From the replies elicited to the inquiries of your Committee, and from our own observation and experience in the cost of keeping up the repairs of engines engaged in switching service exclusively, we would recommend that for this service six miles per hour for the time that such engines are in actual use be allowed; that for engines running local freight trains an allowance of 6 per cent. to the train mileage be allowed for switching; that where engines run empty to exceed one-half mile between where the trains are taken on or left and the round house, such mileage should be computed; and that for engines running through freight or passenger trains no computation of mileage should be made for switching.

We make these recommendations, trusting that the Convention will fully consider them, and, if approved, that each master mechanic will be governed by them in his computation of mileage, and that in the matter of repairs, where new engines are built or bought to take the place of old ones, the cost of such new engines be charged to repairs; or, where that cannot be done, that a statement to that effect be made in the report, so that others may be able to understand such report and to make an intelligent comparison with those of other roads.

Unless there is an entire uniformity in the matter of keeping the accounts, the same things charged as repairs, the same as new machinery, and the same computation of mileage, on all roads alike, the monthly or annual reports giving cost per mile will be unreliable, calculated to mislead those not familiar with the manner of keeping the account on each particular road, and be of no value as a means of making correct comparisons between the cost of motive power on the different roads; and their publication for that purpose might as well be dispensed with.

All of which is respectfully submitted.

R. WELLS,
Jeffersonville, Madison & Indianapolis Railroad.
E. D. PALMER,
Pittsburgh, Cincinnati & St. Louis Railway.
J. H. SETCHEL,
Little Miami Railroad.

Mr. HAYES, Illinois Central Railroad—I move that the report be received and placed on file.

Mr. SETCHEL—I would like to amend by adding that the thanks of the Association be tendered to the Committee for their interesting report, and their recommendation adopted.

Mr. GORMAN, Toledo, Wabash & Western Railway—Before that recommendation is adopted, I would like to hear some discussion. There are various opinions in regard to the proper allowance for switching, and I would like to hear some of the mechanics express themselves.

Mr. HAYES—It seems to me that if Mr. Setchel will withdraw his amendment and let the report be accepted and placed on file that will be the better way, for it will then come up for discussion to-morrow morning, and we can adopt any thing we choose afterwards.

Mr. SETCHEL—I have no objection to that, and that was my idea in moving to adopt the report of the committee. I want to hear the matter discussed, for I am satisfied that one cause of the great difference in the showing made by the monthly performance sheets is on account of the extraordinary mileage allowed to trains. I want to hear the matter discussed.

Mr. WELLS, Jefferson, Madison & Indianapolis Railroad—As one of that Committee I will simply say that we made this recommendation in order to bring the matter before the members of the Association, and let it be fully discussed and such alterations and amendments made as the Convention might think proper. When that has all been done and the discussion ended, then the question can be brought up whether we can adopt that recommendation or not.

Mr. SETCHEL—I withdraw the amendment with that understanding.

The motion of Mr. Hayes was then adopted, and the Association adjourned to Thursday.

THIRD DAY.

The Association was called to order by the President at 9:30. Voted that the report of the Committee on Mileage be received.

On motion of Mr. Hayes, Illinois Central Railroad, voted that that portion of it recommending a uniform plan of mileage be read, and it was read by the Secretary.

Mr. MAYNES, Selma, Rome & Dalton Railroad—An engine may be in use 14 hours, but may not do more than 10 hours' work. It may stand still part of the time. Do the Committee propose to compute it for fourteen hours or for ten? It is necessary that there should be steam up all the time, and there is some expense about it.

The SECRETARY—It was the intention of the Committee to allow six miles per hour for the time the engine was on duty in the yard.

Mr. WELLS, Jeffersonville, Madison & Indianapolis Railroad—In reply to the question the gentleman just asked the Committee, I can state, as one, that I did not propose to recommend that engines should be allowed mileage during the noon hour, or at any other hour or time when the engine is standing still for some considerable time. For instance, if you compute the time from the time the engine is taken out of the house in the morning until it is returned again in the evening, if an engine is not used during the dinner hour or any other hour during the day, that hour should not be counted in; only just such time as the engines are in use, in service.

Mr. MAYNES, Selma, Rome & Dalton Railroad—I asked this question for this reason: When switching they are in the yard at home; the noon hour, of course, is generally not used, but its equivalent is given at some portion of the time. Men require an hour for dinner. Then there are the hours in the day in which they may stand there for two hours, waiting perhaps on account of the delay of trains, and the cars cannot be got to complete another train preparatory to going out. Whether we should take that into account, and make that deduction on the mileage? It would be very difficult to trace that matter up. You would have to rely entirely upon the statement of the men, unless you were to adopt some system whereby we could compute and make a fair mileage from the time they go out of the

* See above.

round house in the morning until they come back, and not have to rely upon any statement at all. We know when we go out and when we get back at the shop.

Mr. KELLER, Flint & Pere Marquette Railroad—I don't see any objection to adopting the six miles per hour from the time they go out, with the exception of the noon hour. For the two hours they may have to wait for a late train, if they have to wait, they have got to work as much as if the train was on time.

Mr. YOUNG, Cleveland, Columbus, Cincinnati & Indianapolis Railroad—It seems to me to be very unjust to allow a certain number of miles per hour for switching engines. It would be for us. Some are working the whole time, while others in other yards stand still the whole time. I don't see any other way to get at this thing but to regulate the mileage for each engine. That would seem to be the only just way in my opinion. There is a great difference in the different yards. Where they work in some, they are busy all the time without resting the noon hour, while others are lying still perhaps one-third of the time. If they are all allowed six, five or seven miles an hour, some get more mileage than they are entitled to, and others do not get as much. I should think it would be better to regulate this matter according to the business of the engine.

Mr. TOWNE, Hannibal & St. Joseph Railroad—I cannot see the need of counting the noon hour at all in using the switching engines. In the first place, a switching engine is not used unless she is required. Wherever an engine is required, her service is worth her hire, and I see no way to get at that, except to allow a certain number of miles per hour for each switching engine in the yard. In a yard where there is a great deal to do it may work more than that, but in yards where there is little to do, where there is more to do will make up for where there is less to do. I should think six miles would be about the fair thing. In many yards it would be no more than fair to allow ten miles an hour. Our engines go out between six and seven; sometimes get in at seven in the evening, and again not until ten. We allow only twelve hours a day. Sometimes she works fourteen hours, or as long as fifteen; at other times not more than nine or ten. That makes an average day's work twelve hours, at six miles an hour, unless on extra occasions, when she does extra work. Then we allow extra time.

Mr. SETCHEL—I cannot see any propriety in deducting the noon hour, or any other hour, for switching engines while standing still. We allow a certain rate of miles per hour, supposing that that is somewhere near in proportion to the fuel and stores and repairs of the engine. The repairs, of course, are not going on when the engine is standing still—that is, the cost, but the stores are being used. A switching engine that is standing still every few minutes will use a great deal more oil than an engine that starts and runs a certain number of miles. You pay the engineer and the fireman when they are lying still as well as when they are running, and it seems to me, in order to arrive at a fair comparison between roads, that it is necessary to observe some uniform system. Now, with us, we allow five miles per hour and twelve hours for a day's work, which is sixty miles. The engineer and fireman work 12 hours for a day's work; but in running locomotives we allow nothing, and never have allowed a mile. Engines running from the engine house to the train are allowed the mileage they make, and not a mile over. I am satisfied that a great part of the difference between performance sheets that we exchange is owing to an excess of mileage allowed. Perhaps it has been the custom for years. Some years ago I was on the Louisville & Nashville road, and we invariably allowed there ten miles an hour for switching engines. When you come to take six or eight switching engines, and put the cost per mile run for fuel and for repairs, etc., and divide it up into 75 or 100 engines, it makes a material difference in your performance sheets; but how are we going to tell this? Our superintendents watch us and compare with other roads, and it is right and just that they should. So far as I myself am concerned, I confess to have a laudable ambition to do as well as any man in the country can do under the same circumstances, and when my Superintendent comes to me and says we are not running as cheap for repairs or for oil, I want to know whether they run the miles or not, or whether it is based upon an extra number of miles. It has been the custom of some roads to allow—as one of the leading lines has stated in the report—24 per cent. for mileage on trains running local freight. Take that on 2,000 or 2,500 miles, and it makes a material difference in the showing of the performance sheet, and it is just to each member here that we should adopt a uniform system. I don't say we can say to our superintendents "We are going to do this," because that cannot always be done. Some roads have kept their reports for years, and they desire to refer back and see whether the late repairs compare with the previous years, and in such cases the Superintendent might object to any difference being made in the rate of mileage or to any difference being made in the cost of repairs. That is something we cannot say, that we will do this, but we can say this: that when these variations are made from what this Convention will say they will be done by in making out their reports, we will make a note of it in our report, so that we will all understand it and be able to make an intelligent comparison. I see a great number of roads that include in the matter of repairs, as extra expenses, the putting on of a tire or the breaking of a crosshead, or putting in new sheets in the boilers, and some very simple things that they put in and make a long string of extra matters. That seems to me to be unfair. It is simply keeping up repairs. Then, as stated in that report, if a new engine is bought to replace an old one, it seems to me only the difference between the value of the new engine and the old one should be charged to construction, but it should be charged to repairs—the keeping up of engines. If my Superintendent takes five or six old engines and breaks them up and buys half a dozen new ones and charges it to construction, it leaves a fair chance for years to come for me to make a good showing for keeping machinery in order; but if I am obliged to charge that to repairs, as it should be, it is another and very different thing.

Mr. KELLER, Flint & Pere Marquette Railroad—I move you, for the sense of this Convention, that the recommendations be adopted as recommended by the Committee.

Mr. HAYES, Illinois Central Railroad—Before that question is put, I would like to say a word or two. This subject of uniformity of mileage sheets has been a knotty question with me for years, and I have had a good deal of correspondence both with our President and Superintendent upon the subject. They have at times said to me, "Why can't you run as many miles on your road to a ton of coal as that gentleman runs; why can't you do your repairs as cheaply as he does? Why can't you run as cheaply per mile for wages of engineers and firemen?" All these different questions that enter in to make up the sum total of our mileage sheets have been asked me. I simply say to those gentlemen, "Let us have a uniform system, and then I am willing to compare notes with any other road under similar circumstances. Now, I know of some roads, gentlemen present here, that have allowed from 150 to 216 miles to a ton of coal. Now every gentleman present knows as well as I know, or as you know, that no engine will run that number of miles, yet that appears upon their sheet and enters into the sum total of the cost of running their road. How can you or I compare with such roads? Unless we bring this thing down to a uniform system, we never can arrive at any conclusion, and the consequence will be that the publication of these monthly sheets will be entirely swept out from the railroad community. In regard to the purchase of new engines, it reminds me of the story of the old lady that had a knife that had been in the family for 300 years. The handle got broke at one time, and there was a new handle made to it; then the blade wore out,

and there was a new blade put into it; but it was called the same old knife that had been in the family for 200 years. That is the way we propose to keep up our engines, and the way we have to call it "maintenance of engines." When an engine comes on to our road we propose to maintain it from the day it comes on to the road until the road sinks into the earth. That seems to me to be the proper plan. I make no objection to the recommendations of this Committee. I think it is pretty nearly correct; it differs a little from the system we have heretofore adopted in regard to switching engines. The system we have adopted heretofore has been to allow them six miles an hour for every hour while on duty. That does not include the dinner hour. And after the regular day's work, if they work more, we allow just in proportion to the number of hours. If they work 20 hours, we allow them 20; if they work 10, we allow 10. In computing that, we find at the end of the month, in allowing certain engines, particularly those switching passenger trains, sometimes they will make 150 to 180 miles to a ton of coal. I know that is too much, and consequently I have adopted the rule of allowing eighty miles to a ton of coal; if it exceeds that, I cut the miles down to that standard, and hence you will find some of our switching engines will average 80 miles to a ton of coal. Others will not average over 40. The engines run from Chicago to South Bridge, and it is a heavy pull, and they will consume about the same amount of coal that an engine would pulling a regular freight train. Hence you will find, if you allow them six miles while on duty, there will be a great variation; and any road that does a large amount of light switching will not compare favorably with one that does a large amount of heavy switching, and, consequently, you will not arrive at a fair comparison with the different roads. It seems to me you should adopt a certain system where you burn coal or wood, and let the miles for light switching be proportioned by the amount of fuel consumed, and where you are doing heavy switching, you may take your six miles an hour, if you choose. In regard to the allowance for switching on the line of the road, it seems to me you could get at a fair conclusion by the adoption of an instrument for recording mileage—like this. I do not know anything about it, but I have seen them on steamers, and I believe they are pretty correct. If a road could have one or two of those, and try one upon each class of trains, it would show about the proportion of miles that each train makes. You need run it but a trip or two to ascertain that; and after you have done that, put it on another class of trains. We have been in the habit of allowing for our engines running way freights, 9 miles to 116, which is about 7 percent, or somewhere along there. That has been the rule for a good many years. Then running through freights, starting from Chicago and running to Champaign, or Champaign to St. Louis, or St. Louis to Chicago—where they run through freights we allow the miles between the point of starting and the point of destination. I think that is fair and proper. If we compute this on the same basis, we can arrive at a fair comparison and at a fair conclusion; but unless we do this, you will find this whole thing will be swept out of existence. Prior to coming here I had a conversation with some prominent superintendents in relation to this matter. In fact, I sent them a report the same as I sent to Mr. Wells, and requested that they would say it before the convention of superintendents. They promised me they would do it, but the Superintendent to whom I sent the paper on coming to leave his office found he had mislaid it, and of course did not take it with him; but he told me he brought the subject up and they had requested us to adopt a plan, and if it was a feasible plan they would take it up at their next meeting of superintendents and would request that it be adopted, or would make such changes as they thought necessary, and would request or instruct their master mechanics to follow that rule. If they do that, if we can get the superintendents to take hold with us in that matter, we can then arrive at something that will be reliable. There is another question while upon this subject. We publish all of us, our monthly reports. That is expensive, both publishing and mailing. Why not adopt some rule and let us send a copy to the RAILROAD GAZETTE, or some other paper, and let them put them all into shape there and publish it to the world. That will save us a good deal of expense in sending these reports around. It costs us two, three or four dollars every month for postage stamps to ship these reports off to the different roads in the country. It seems to me if we could hit upon some plan of that kind, whereby we could call that paper the organ of the Association, and let it compile and put these reports altogether, so they would be intelligible, every one can compare without this expense of sending them out. I prefer printing ours and giving each engineer a copy, so I can say to him, "Here is a copy of what you have done, and what every other engineer has done upon the road, and if you have not done as well, I want to know why. You are both running the same kind of engine, and upon the same class of trains." It strikes me if we could get hold of the matter in that way, and have it published in some paper, it would save some expense. However, that is a matter for the Association to consider, and it is of very little moment to the railroad companies.

Mr. MAYNES, Selma, Rome & Dalton Railroad—I agree with Mr. Hayes in all his remarks, but he has left out one thing I would like to have heard him make some remarks about—that is, a better classification of expenses for repairs.

The PRESIDENT—The question is on mileage. Mr. HAYES—I suppose it includes everything on that sheet; everything connected with the performance of locomotives published in the sheet.

The PRESIDENT—I did not do so understand it.

Mr. MAYNES—I supposed it included the whole sheet. There should be a classification whereby each and every one can figure upon the same basis and charge repairs up from the same standpoint. On the column of extra repairs we can all differ. My own idea is to throw out that column entirely and charge the whole up to repairs, and then coming down to the cost per mile run, let us show the whole thing. I don't know that I have any particular plan to suggest on it. I bring the matter up to hear from some of the older master mechanics. I think it is an important question. It is to me. I consider myself a young member, and would like to be informed on it. I would like to hear from members of the Convention, particularly men who have had the experience of our friend Hayes, on some classification whereby we can be governed by the same rule in charging up expenses.

Mr. ROBINSON, Great Western Railway—If Mr. Hayes will allow what he has said to stand in the form of a motion, I would like to second it.

The PRESIDENT—There is a motion before the Convention now.

Mr. ROBINSON—In regard to computing the mileage, I think it may be useful to state the way we arrive at our switching service on local trains. We obtain the conductor's report of every train and the driver's report. If they agree we accept them; if not, each case is investigated. In that way we get the number of hours. On our switching engines we have this rule: The station masters have to report to the Assistant Superintendent the number of hours they require a switching engine to be on service. About once a month we make very strict inquiries into the hours required by each switching engine, and by looking into the matter, if I find any man is not fully employed, his case is brought before the Superintendent, and the engine is sent home perhaps an hour earlier. So by keeping a strict lookout on the work done in yard service it seems to me engines will not be laying out doing nothing and filling up performance sheets. Engine drivers are apt to think that they can sit down on the engine, and have a sleep or

read the newspaper, and have their time go on and get their wages, and have the mileage reported; it satisfies everybody as far as it goes, but it is very incorrect as far as comparison is concerned. We are satisfied that the rule we have is a good one until we find a better one. The recommendations of the Committee, I think, are very moderate and very liberal and very much to the point. The subject, it seems to me, is very difficult, but not more difficult than it is important. The difficulty I see in the case is in each road comparing with previous statements. A master mechanic will take a position on a railroad where he has had perhaps three or four predecessors. The Superintendent and President are very fond of comparing the result of that person's management with his predecessor's management, and unless he is very careful, if we begin to reduce the rate of mileage, it would look bad for the reputation of the person in office. That will be a great objection to any alteration being made. I think it is very important that the matter should be recommended to the attention of the superintendents, that they may see the necessity of making the change, and if it is worth the expense the sheets could be got out in two forms—one for the use of their line, and the other for the whole country. In that way we could get over the difficulty, and if we do that I think it makes a feasible way of overcoming a difficulty which might otherwise be considered insurmountable. In regard to construction account; my opinion in regard to construction and repairs is this, and I am borne out by the experience of the old country, and the same plan is in operation in Canada. We say, if you destroy an old construction and replace it with a new one, the charge to capital account, or what you may term construction account, is the difference in value of the old construction when it was new, and the new construction. What was the old construction worth when it was first put in? \$1,000. What is the new one going to cost? \$2,000. Charge to construction, \$1,000. If I take an old tank house—they are always being pulled down—if I pull down an old tank house worth \$200 and put up a new one worth \$2,000, I would not charge \$1,800 to construction account, but I would say what was the worth of this when it was put up. I would say \$1,000, and the difference to be charged to capital is \$1,000, and I must charge my old maintenance account with the \$800, for if I was to replace it as it was, there is no charge to capital. Whatever increase of value I put upon it is charged to construction. The stockholders say, "If you go on increasing your capital account, by charging what belongs to repairs, in fifty years the line will be put down at double what it is worth, but if you confine yourself to charging us the advance you have made over and above what originally existed, we shall all the time have the value of our money represented in stock in our hands." I wish to be clearly understood that it is the difference in value of the old construction at the time it was first built, and not at the time you were improving it, or putting up the new one. That applies to locomotives or any portion of the rolling stock.

The SECRETARY—That is what is given in the report—the difference between the price of the old one—

Mr. ROBINSON—When it was new?

The SECRETARY—The difference between the price of the old one and the new machine.

Mr. ROBINSON—What I say is the difference in price when it was new.

The SECRETARY—That is not the report.

Mr. WELLS, Jeffersonville, Madison & Indianapolis Railroad—I wish to say a word in explanation of that matter. It is my intention to state the value of the old machine when it was new, the same as Mr. Robinson suggests, and if that is not embraced in the report, it ought to be. That was my intention. We mean to charge to new account the difference between the old engine when new and the present new one. If the present new one is worth \$5,000 more than the old one when it was new, the \$5,000 should be charged to construction.

Mr. HAYES, Illinois Central Railroad—Perhaps I could illustrate that question by stating that last year we sold an old engine after having rebuilt her. She was an engine that cost about \$7,000 originally. That was a good many years ago; 15 or 20 years ago. We sold that engine for \$9,000 after rebuilding her. We then, after selling her, went to work and built a new one which cost \$12,000; \$3,000 of that new engine was charged to repairs. We sold the old engine for more money than it cost originally, and the difference between what we sold that for and what it cost to build the new one was what we charged to the repair account. There was one question I did not speak of before; that is, the wages of engineers and firemen running switching engines. We have upon our road three or four engines.

The PRESIDENT—We have a report upon engineers and firemen which will come before the Convention.

Mr. HAYES—This comes under the head of this report. We charge the wages of the engineers and firemen on one sheet. The wages of our switching engineers and firemen where they are running day and night, we find, amounts to 10 or 11 cents a mile, while with the engines on the main line it is from 5 to 6 cents a mile. Hence it is necessary that we keep the mileage up on switching in order to compensate for that difference in pay per mile run. When we come to look at the pay of switching engineers, it is enormous, yet we are allowing them very few miles. They will run for the whole 24 hours and not make as many miles a day as one running a train a day. That should induce us to keep the switching hours as high as possible.

The report of the Committee was adopted.

Mr. SETCHEL offered the following resolution, which was adopted:

Resolved, That the Secretary be instructed to communicate to the Association of Superintendents the action of this body in regard to the mileage of engines; and respectfully ask that it or some similar arrangement be adopted, in order to secure a uniform system of mileage and charges to engines in monthly performance sheets.

Mr. JACKSON, Rome, Watertown & Ogdensburg Railroad—I now move you, that the alteration be made in that report which has been referred to.

The SECRETARY—That report is just as Mr. Wells stated. I understand it as Mr. Robinson did.

The report of the Committee on the Application of Compression Brakes was then read.

REPORT ON APPLICATION OF COMPRESSION BRAKES.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee to whom was referred the subject of "Application of Compression Brakes," having received thirty-three replies in answer to circular questions sent out by your Secretary, beg leave to note that there is evinced great interest in the minds of the master mechanics of this Association in all inventions and application of brakes that will tend to lessen the danger of the traveling public, and by their use prevent accident and loss of life.

Twenty-one master mechanics report as having in use on their respective roads compression brakes, eighteen have in use the "Westinghouse Atmospheric Brake," one the "Creamer," one the "Olstead Electro-Magnetic," and one the "Electric;" no name given of the latter—either of road or brake.

Mr. Setchel, of the Little Miami Railroad, in his elaborate and detailed report in answer to your Committee's enquiries, says: "That they have 60 cars equipped with the Westinghouse air brake; have been in use one year and work uniformly well; and cites a case of his own personal observation where both life and property were saved by the use of this brake, and makes note of several other similar cases; that in his opinion when the subject of brakes of this kind is thoroughly examined, there will not be found as one of its advantages any diminishing in

wear of wheels, etc. The 'Loughbridge Brake,' formerly in use on this road, proved worthless and was thrown aside." Mr. S. favors placing the braking power in the hands of the engineer, though at the same time does not advise the abandoning of the hand-brake or brakemen. In conclusion he says: "That a train can be stopped with the Westinghouse air brake before the brakeman can get out of the car," yet there are many improvements that can and should be made.

Mr. Coolidge, of the Fitchburg Railroad, reports 21 cars already equipped and 20 more being equipped with the "Westinghouse," and have been in use three months, and consider them reliable. No perceptible reduction of wear of wheels noticed, and is not in favor of using brakes controlled by engineer entirely.

Mr. Skidmore, Louisville & Cincinnati Railroad, says: We have in use on our road 6 express, 7 baggage and 18 passenger cars equipped with the Westinghouse, in use five months; and so far as able to judge for the length of time, consider it reliable—has prevented the killing of stock many times. Had in use about twelve years ago a brake (Moore's) controlled by engineer; abandoned on account of chains breaking under cars. Is in favor of a brake to be used in case of accident only to be controlled by engineer.

Mr. White, Evansville & Crawfordsville Railroad, reports eleven cars equipped with the Westinghouse, in use four months, with seeming good results, and says: "The time we have had them in use will hardly justify a report on them as yet."

Mr. Tier, Lake Shore & Michigan Southern (Toledo Division), reports: "Have had the Westinghouse brake in use ten months; are very delicate and need close attention." Does not favor the use of a brake to be used in case of accident only by the engineer, but prefers to place the braking power entirely in charge of engineer.

Mr. Britton, White Water Valley Railroad, reports all of its passenger equipment equipped with the Westinghouse, and it is perfectly reliable; preventing the killing of stock a daily occurrence, and will pay for itself in a very short time for this purpose alone, and has never failed with them. The "Creamer" brake was in use formerly; could not get the brakemen to attend to it properly. It was used quite successfully, however, for some time. Prefers the brake power should be placed in the hands of the engineer at all times. In conclusion says: "I am much pleased with the working of the Westinghouse brake."

Mr. Griggs, New York & Oswego Midland Railroad, says: "We have the 'Creamer' brake on 14 cars; have heard of their application by my engineers when they have saved much property and, possibly, life; are not always reliable, as brakemen neglect to have them adjusted and wound up ready for action." Is in favor of placing the braking power in control of engineer.

Mr. Boon, Pittsburgh, Fort Wayne & Chicago Railroad, reports: "We have in use on all our passenger cars the Westinghouse air brake, about 130 cars; and since using the air brake our defective wheel account has fallen of fully 75 per cent."

Mr. Jauriet, Chicago, Burlington & Quincy Railroad, reports 75 to 100 cars as equipped with the Westinghouse, and gives as his opinion, "that the wheels wear out faster."

Mr. Hill, Erie Railway, reports as having in use on one of their local trains the brake known as "Olstead's Electro-Magnetic Car Brake," which has given perfect satisfaction, and he believes has many advantages over any other brake. Unlike other brakes, it can be applied from any part of the train; from the engine, baggage car, or by the conductor in any one of the cars. With this brake every car is independent; consequently, if any one should get out of order, it does not affect the efficiency of the brake on all others. Mr. H. reports one case where this brake prevented a serious accident, and to his knowledge it has never failed to work well at all times. Is strongly in favor of placing the braking power entirely in the hands of the engineer.

Mr. Philbrick, Lawrence, Leavenworth & Galveston Railroad. That their road is about to equip with the Westinghouse brake.

Your Committee, having given a limited number of extracts from different reports received, beg leave to more particularly ask your attention to the synopsis report herewith attached, wherein is noticed under their respective heads the opinions of the few who have seen fit to reply to your Committee's inquiries. They would also add in their own connection that the conclusions arrived at are: that in the use of the compression brake serious accidents have been prevented, and both life and property saved.

In regard to reduction in wear of wheels, etc., opinions differ, as will be observed by reference to reports from Mr. Boon, Pittsburgh, Fort Wayne & Chicago Railway, and Mr. Jauriet, Chicago, Burlington & Quincy Railroad. Your Committee would conclude that the braking power should be placed under entire control of the engineer, though at the same time not by any means advising the dispensing of the ordinary hand-brake and brakemen.

Respectfully submitted,
A. MITCHELL,
CHAS. GRAHAM.

SECRETARY'S LETTER ON COMPRESSION BRAKES.

A. Mitchell, Esq., Chairman of Committee on Compression Brakes:

DEAR SIR—We have the Westinghouse air-brake in use on our road on all passenger trains (about sixty cars). It has been about a year since the first was put on, and on cars it works uniformly well. It requires but little more care than the ordinary hand-brake. The air-cylinders require a little oil often, in order to prevent the brake from sticking after being put on, and also to prevent the use of too much air in applying them. This sticking, or failure of the brake to let off quickly, is to some extent an objection in approaching wood and water stations, where it is required to stop at a certain point; but in making ordinary stops at stations, where that exact nicety is not required, the air may be let off before the stop is fully made, and the motion of the train will in a great measure relieve the tendency to stick. I think it may be safely stated as a fact that with the required amount of air in air-drums the brake works well. The difficulty, as at present constructed, lies in the failure of the auxiliary engine working the air-pump to work regularly. When everything is nicely adjusted and well oiled, it works well. But to keep it in this fine working order is more than it is possible for the engineer to do at all times, and frequently it is necessary to start it by hand several times between stations to keep up the supply of air. This takes the attention of the engineer from the track, and is extremely dangerous. This can, however, and should be avoided. There is no occasion for this complicated piece of machinery to work an air pump and a locomotive, when you have any motion desired, and where the power required to work it will operate as a retarding force to the momentum of the train and thus avoid the loss of power necessary to work the present style of pump. It is claimed as an objection to this, that the air pump must be independent, so that the air reservoir may at all times be charged ready for use. I do not think this point is well taken, inasmuch as every engine will run far enough and occupy a sufficient length of time in doing it to fill the reservoir with the necessary amount of air before starting with the train, and it would be difficult to imagine a case where air would be needed when it could not be supplied by a pump worked by the engine in motion.

The Westinghouse Air Brake Company should see that this really valuable brake is relieved of this incubus as soon as possible. As to the saving of life and property by this brake, I do not hesitate in the least to say it has done both of these since first applied on our road. I will mention one instance

APPLICATION OF COMPRESS BRAKES.

NAME OF ROAD.	Kind of compress-brake in use.	Number of cars equipped.	How long in use.	If considered reliable.	Any case of saving life or property with this brake.	Any case of loss of life or property with this brake.	Any perceptible wear in wheels or other car repairs.	Other kind of brake that have been used.	Why abandoned.	In favor of using a brake controlled by engineer in case of accident only.	Braking power under control of engineer.
Little Miami.....	Westinghouse.	About 60.	1 year.	Yes.	Both; see elsewhere.	No.	Think it will not make any difference.	Lockridge.	Worthless.	See opinion stated elsewhere.	....
Fitchburg.....	do.	21; equipping 20 more.	3 months.	do.	Not known.	Not known.	Not noticed.	Not noticed.	None.	Yes.	No.
Louisville, Cincinnati & Lexington.....	do.	31.	5 months.	do.	Saves killing stock often.	do.	Not in use long enough to notice.	....	....	Yes.	....
Evansville & Crawfordsville.....	do.	11.	4 months.	do.	Not any so far.	No.	Not stated.	None.	....	Controlled with half the usual force of brake-men.	....
Lake Shore & Michigan Southern.....	do.	231.	1½ years.	do.	Several cases.	No.	Much less wear of wheels.	do.	....	....	Yes.
Do. do. Toledo Division.	do.	On all trains.	10 months.	do.	Cannot state.	Can't state.	Not noticed.	do.	Unreliable.	....	Yes.
Eastern Railroad.	do.	7.	3 months.	do.	do.	No.	do.	Brown's.	....	....	Yes.
Cleveland & Pittsburgh.	do.	55.	16 months.	do.	Prevents killing stock.	No.	Think wheels wear longer.	None.	....	No.	Yes.
Toledo, Peoria & Warsaw.	do.	On all trains.	6 months.	do.	See report.	No.	No stated.	Not stated.	....	No.	Yes.
Pittsburgh, Fort Wayne & Chicago.	do.	131.	2 years.	do.	At least 4 cases.	No.	75 per cent. less wear of wheels.	None.	....	No.	Fully.
Memphis & Charleston.	do.	4.	2 months.	On Western Division, so cannot state.	Cannot state.	Can't state.	Not in use long enough to state.	do.	....	No.	Yes.
Louisville & Indianapolis.	do.	35.	2 years.	Yes.	Yes.	No.	20 per cent. less wear of wheels.	do.	....	No.	Yes.
Old Colony & Newport.	do.	30.	1½ years.	do.	Two cases.	No.	Not noticed.	do.	....	Yes.	No.
Chicago, Burlington & Quincy.	do.	75 to 100.	1 year.	Not stated.	Not stated.	No.	Wheels wear out faster.	3 others.	Not stated.	No.	Yes.
Flint & Pere Marquette.	do.	20.	5 months.	Yes.	Saving animals almost a daily occurrence.	No.	Find less flat wheels.	Electro-Magnetic brake, J. O. M. Stead's patent.	Chiefly through mechanical defects.	No.	Yes.
Illinois Central.	do.	Are equipping more.	....	do.	Not stated.	No.	Think should not make any difference.	Not stated.	....	Prefers a brake that can be used in all cases alike.	....
White Water Valley.	do.	7.	9 months.	do.	Saves killing much stock.	No.	Uncertain.	Creamer.	Brakemen would not attend to it.	Yes.	Yes.
Toledo, Wabash & Western.	do.	1 pay car.	6 months.	do.	Yes.	No.	Not noticed.	Lockridge.	Chains breaking, &c.	Not entirely. Should use hand brakes also.	....
Leavenworth, Lawrence & Galveston.	Waiting to equip with Westinghouse brake.	....	....	....	....	....	Cannot state yet.	....	....	....	....
New York & Oswego Midland.	Creamer.	14.	6 to 8 years.	If wound up and ready for action.	Yes.	Not known.	Not noticed any.	None.	....	No.	Yes.
Buffalo, Corry & Pittsburgh.	None.	....	....	....	....	....	....	....	....	Yes.	....
Great Western.	do.	....	....	....	....	....	....	....	....	Yes.	....
Hartford, Providence & Fishkill.	do.	....	....	....	....	....	....	....	....	Yes.	No.
Maine Central.	do.	....	....	....	....	....	....	....	....	Yes.	....
Atlantic, Mississippi & Ohio.	do.	....	....	....	....	....	....	....	....	....	Yes.
Raleigh & Gaston.	do.	....	....	....	....	....	....	....	....	....	Yes.
New Jersey Southern.	do.	....	....	....	....	....	....	....	....	....	....
Connecticut, Passumpsic River & Massachusetts Valley.	do.	....	....	....	....	....	....	....	....	....	Yes.
Lackawanna & Boonburg.	do.	....	....	....	....	....	....	....	....	....	Yes.
Erie Railway.	Olmstead's Electro-Magnetic.	One train.	Not stated.	Perfectly.	Yes.	....	Not stated.	Not stated.	....	....	Yes.
Unknown.	Electric.	4.	3 months and then abandoned.	No.	No.	No.	No reduction, and increase of repairs.	....	....	Yes.	....

where it saved property and possibly life. The latter, of course, cannot be positively known. By an oversight in the conductor of a fast passenger train in not informing his engineer that the switch at M. would be opened for them to enter a side track, meet and pass an approaching train, the engineer, having sufficient time, concluded to run by the station and back in on the other end of the switch. As he approached the station he applied the brake to see if all was right, merely taking up the slack of train, and then letting it off, and as he did so he saw the switch was open and cars standing on the track ahead of him. He applied the brake. The passengers surged forward in their seats and remarked, "Something has happened." Being on the train, I stepped forward to see what was the matter, and found the engine broken loose from the tender and standing about fifty to seventy-five feet ahead of the train, where it had run into some cars, breaking the pilot and doing some other slight damage. The train had not touched the cars, and the engine had been snapped, like the cracker off of a whip, from the tender and received all the damage that was done. There is no doubt but that in this case both property and lives were saved by the use of this brake; and there are many other instances—if the truth could be known—where accidents have been prevented. And on the other hand, there is danger in the use of this and all other brakes controlled entirely by the engineer. For example, if in running a fast train on a down grade the engine alarm sounds, the train must be stopped. It may be that a car is off the track; and if so, the sooner the train is stopped the better. Many cases might be cited to show that if the train had been stopped soon enough, it would have been saved from going down the bank, or into a bridge, as at Carr's Rock, Angola, and recently on the Columbus, Chicago & Indiana Central Railroad, where the train ran down the bank only after running far enough to have stopped twice had the air brake connection not have been broken, killing the fireman and fatally injuring the engineer. But suppose, instead of any of these, that the alarm sounds and the train has separated. The bell's wild antics may say stop, and the brake is applied and the train is telescoped. This is not imaginary. Trains are often parted in running, and if in the night, it is difficult to tell whether the train has parted or if a car off the track, or a refractory passenger to be ejected is the cause of the alarm. Two accidents of this kind have happened with us within the last year, but fortunately resulting only in a few broken platforms and draw-bars. Another accident was prevented by the alarm failing to sound as the train parted, and the engineer discovered it by the working of his engine, after running some distance. A number of accidents of a more serious nature have occurred on connecting lines from this cause, which, I presume, will be reported to your Committee by the proper authorities.

I am aware that it is claimed that the use of brakes of this kind diminishes the wear of car wheels, but I think when this subject has been thoroughly examined that this will not be numbered as one of its advantages. That the natural tendency of the use of the brake in the hands of the engineer is to make quick stops, I think will not be disputed, and he cannot, like the brakeman with the hand-brake, look and see when the wheels are being slid, and if the cars are empty they will slide easy, and vice versa if loaded. It is no uncommon thing in using the Westinghouse air-brake to see the wheels of empty express cars sliding, while those of the loaded cars do not. But if the slipping of wheels were no more frequent than with the ordinary hand-brake, in proportion to the number of brakes applied, the general wear of wheels must be greater; for with the Westinghouse air-brake, as well as with all others controlled entirely by the engineer, the brakes are applied to all the cars on the train, whereas with the ordinary hand-brake it is never applied to express and baggage cars, and frequently to not all the passenger cars; and the wear of course would be in proportion to the number of

wheels to which the brake is applied. A number of roads that were the first to adopt the atmospheric brake applied it to the tenders of the engines as well as the cars; but it was soon found that the fact of the tenders being loaded only about one-third of the time caused so much slipping of the wheels that it made a considerable increased expense in keeping up repairs, and but few roads now use it in this way. Have had some little experience with the Loughridge brake, but it has been thrown aside as worthless. I have seen in my experience nothing to compare with the Westinghouse air brake.

I do strongly favor and urge the adoption of the practice of putting the braking power entirely in the hands of the engineer. I would not advise doing away with the hand-brake or the brakeman, but the braking can be done ordinarily better by the engineer, especially in the night; for he alone has a proper conception of the speed of the train, the condition of the rail and the distance within which he must stop his train. In a case of extreme danger, a train can be stopped with the Westinghouse air brake before the brakeman can get out of the car; yet this is in its infancy, and there are many improvements that can and should be made, but it is undoubtedly the true principle, and it must, it is bound to succeed.

Very respectfully, J. H. SETCHEL,
Master Mechanic Little Miami Railroad.

Mr. BOON, Pittsburgh, Fort Wayne & Chicago Railway.—The statement made in reference to the wear of wheels, which has not been sustained by any other members of the Convention, I wish to corroborate. On the Fort Wayne Railroad the Westinghouse air brake was put in April, 1870, and was run during that summer on fast trains. We tried it on trains making probably the fastest schedule time made in America. After we commenced using them I noticed a decrease in the return of defective wheels. There is a complete record kept of every wheel put on the road, the time it is put in, when it is taken out, and the cause of removal. I noticed in the monthly report a great falling off in the number of wheels, and I visited the shop to inquire why there was such a decrease in the number of wheels, and I became satisfied it was from the use of the air brake. Our trains make a mileage of 3,000 miles per week, and before we commenced using the air brake we would average 1,200 new wheels a year. Since we have used the air brake, we have averaged about 400. That is all we used last year. There has been a continuous falling off. During the months of April and May our passenger business has been extraordinarily heavy. During the month of April, out of the passenger stock there was one pair of wheels taken out—one defective flange. During the month of May, there was one pair taken out. If it is not caused by the air brake, I don't know how to account for it.

Mr. HAYES, Illinois Central Railroad.—I would like to ask Mr. Boon whether his road is now using the same make and pattern of wheel that they were before the adoption of the Westinghouse brake.

Mr. BOON.—Our road is using the same wheels. All the wheels are made by the Ramapo Wheel Works; no other kind of wheel is used.

Mr. SETCHEL, Little Miami Railroad.—I allow the perfections of the Westinghouse air brake, but I don't think the saving in the wear of wheels is one of them. I will tell you why I don't think so. In the first place, the Westinghouse air brake is applied generally to all the cars in the train. In using the ordinary hand brake it is seldom or never done; you carry one or two brakemen and brake on perhaps two or three or four cars in the train, and that is all. On the baggage, express and very often on an extra passenger car or two there is no braking done at all. Certainly, allowing that it does well, so far as the saving of the wear of wheels is concerned as compared with the hand brake it must have a falling off, from the fact that it is put on more wheels on the train. Then, on the other hand, you cannot watch the brake; you cannot watch its action as accurately as you can the hand brake. With the hand brake the

brakeman puts on the brake and he bears over to see how it is working, and after he has tried the brake once or twice he knows when he is sliding the wheels and when he isn't. And when he is sliding them he lets it off a little, but with the air brake the natural tendency of all engineers is to come into the station with a rush and make a quick stop. Every engineer who knows he has a reliable brake is desirous of making quick stops. I have noticed it two or three times coming from Cincinnati here, and have seen three or four wheels sliding in the train. I cannot see how this helps the wear of the wheels any. It is on more wheels in the train, and the engineer cannot see when he is sliding the wheels, and, therefore, it seems to me the wear must be greater. Then, again, there is another thing: In our fast passenger trains or through trains there are a great many express cars drawn. If the brake is equipped to properly brake on a loaded car, it will slide the wheels on an empty car, and it is generally on all the cars in the train. Again, it is placed on some roads on the tanks. The tanks are run about one-third of the time about one-third loaded; and whenever the tank is not loaded, unless the brake is applied very light it will slide the wheels; in fact, I know of a number of roads where, in first using the brake, they put it on the tenders, and have since taken it off. The brake was supplied to me to put on tenders, but I objected to it very strongly, and I have got the brakes on hand. I would not put them on under any circumstances unless ordered by the superintendent, which I have no fears of, or any other superintendent who has examined the matter carefully.

Mr. ELLIOTT, Ohio & Mississippi Railroad.—I differ with Mr. Setchel in regard to the wear of wheels from these brakes. I am satisfied the wheels wear longer, because the brake is applied to all the wheels in the train. But that is not the point that I think of most myself in regard to this brake. The principal thing for us to reach is to find out which is the best and most reliable brake of all the brakes that are in the hands of the engineer. The time seems to have arrived when it seems to be almost absolutely necessary that we should have a brake in the hands of the engineer. Three years ago there was not anything of the kind in use; now there is one kind or another on trial on all the roads in the country. On our road we are trying three different brakes that are in the hands and under the control of the engineer, and so far as the wear of the wheels is concerned there is but little difference. We have the Westinghouse air-brake, the Goodale steam-brake, and a brake operated with one cylinder under the tender, running through the train with a chain, that is doing good service. The whole question seems to me to be which we can rely most upon, so when we want a brake we shall be sure to have it. We have been using the Westinghouse brake ten months on two of our through trains, and it has given very general satisfaction. However, it has failed at times. It would run perhaps three months and there was not such a thing as failure, and then the air-pump would begin to stop. Of course we could hardly account for it. Then it is rather a complicated piece of mechanism. We commenced having trouble about it at that time, and have had more or less trouble since. However, as a general thing it works well, and my impression is there is a great saving in the wheels, if wisely adjusted. You can apply just sufficient force not to slip your wheels; that is what we want to avoid, and there is always more or less of that in the hands of brakemen. There is more or less setting them up as tight as they can set them, but there is a limit to the air-brake. I believe this subject of brakes was not continued until next year. I think it would be well to continue the committee for another year on this subject of power-brakes, and I would make that motion if it is in order.

Mr. HAYES, Illinois Central Railroad.—Before the Chair puts that question, I would like to ask whether it cuts off all discussion at the present time?

The President—No, sir.
The motion was agreed to.

Mr. HAYES—I would like to say a word or two in reply to our worthy Secretary in regard to the wear of wheels. This, however, is more theory than from practice. We have just adopted the Westinghouse brake upon our road, but have not got it fully in use on all of our trains; but I can readily see that the Westinghouse brake, or another brake under the control of the engineer, worked by power that is completely under his control, that can be so regulated that you can apply the brake to every wheel in the train, will cause less wear and tear to those wheels than when it is applied by unskillful brakemen, who are liable to slide the wheels upon two or three cars at a time. Now, if you start with the tender of your engine and apply the brake then, and graduate your power then in the beginning just in proportion to the weight held upon that tender when it is empty, how are you going to slide those wheels? Do the same upon every other car in the train, and the result is the power exerted upon those wheels is three times what would be exerted by ordinary brakemen, and yet you need not slide the wheels. That being the case, I can see why wheels will wear a great deal longer. That is merely my theory in the matter (not having had any experience), but I know that with unskillful brakemen, we have had to put in wheels that cost twenty dollars a piece after running one trip; but with the Westinghouse brake, so far as we have used it, I have not seen a single wheel spoiled. If by unskillful workmanship you get your brakes graduated wrongly and apply too much power you can spoil any wheel. I can't apply a brake half as strong as some of the Irish brakemen that are employed. They will slide the wheels every time. I think the theory of the Secretary is incorrect, and I think you will find the experience of the gentlemen here will contradict it. I think by having a brake perfectly under the control of the engineer, it can be so arranged and so graduated that you need not spoil a wheel in twelve months.

Mr. FLYNN, Western & Atlantic Railroad—I have had some experience in the use of the Westinghouse brake; we have had it for six months on all our passenger trains, and I must agree with Mr. Hayes. We find no difficulty in spoiling wheels, and less difficulty than under the old system of the hand brake. Our worthy Secretary spoke of the tender; I found that difficulty at first, but it was very easily overcome. I have changed the wooden brake box to an iron shoe brake, and from that time have had no difficulty whatever. I am in favor of having the brake under the control of the engineer. I have cautioned my engineers in going into stations, or when they use the brake to prevent killing stock, not to throw it on with such force as to stop in going a very short distance. They are well pleased with the brake. At first they had some objection to it; it was a new thing to them and a new thing in our country. So well satisfied are we with the Westinghouse brake that every road in our section has adopted it. So far as my observation goes, it is the best brake I have known, and I am very well pleased with it.

Mr. SUTCHER, Little Miami Railroad—I intended to say just enough to excite the indignation of the advocates of the Westinghouse air brake, to create discussion. Last year the subject was brought in here and passed over without a single word being said about it. We took it and swallowed it right down as the best thing. I believe in the use of the brake; I believe that it is the best thing that has been used, but I wanted to hear some discussion, I wanted to hear all sides of the question. We have a statement from Mr. Hill in the report that he has a brake in use on a coal train on his road that has proved itself perfectly reliable; that it can be set from any car in the train without affecting its operation on any other car in the train; and if that is the case it is possible that that may be equal to the Westinghouse air brake; it looks a little like it, I confess, but unless that brake is equal to it I have never seen anything that is. I like it. We have had it in use eighteen months. I know it is worth the trouble and cost in saving stock alone. I was on a train not three months ago when I have no doubt it saved the lives of passengers, and a great deal of damage to the rolling stock. In approaching a station, the engineer felt his brake to see that it was all right, merely taking up the slack of the train and then letting it off; as he did so, he saw a switch was open and cars standing on the side track, and immediately applied the brakes again. As he did so, the slack of the train, being concentrated on the engine, snapped the engine from the train. The engine went forward and run into the cars, smashing in the pilot and front end, and smoke stack, but the train and tender were not hurt. When the engine parted from the train it broke a 24 inch bolt by the application of the brake. There is no doubt in that case many lives and much property were saved. I have often been running upon engines myself when I was satisfied that horses and cattle would have been killed if it had not been for the Westinghouse brake. But I think that it is not becoming for us to take an important subject like this and swallow it right down, and not say a word about it. So far as the wear of wheels is concerned, I believe just as Mr. Hayes says, that it can be graduated so that it will save wheels in the wear, but on some roads I am satisfied it is not properly put on. In coming here, I stood on a train between the back baggage car and the front passenger car, and in three stops out of four all the wheels on the train were sliding; that is, the wheels on those two cars. That is not the fault of the brake at all, but it is the tendency that engineers have to rush in and make quick stops, applying the power all at once—that is the trouble. If you apply the brakes to a train in season you can stop at the same point, the brake being applied to a greater number of wheels; but if you apply it when you have got only half that distance in which to stop, you have got to put on double the power to stop your train, and you slide your wheels; but the brake can be so arranged that it will not slide the wheels, and it can be properly arranged and put in the hands of careful men with positive instructions that they shall come into stations slowly, and in this way it can be made a good thing in saving wheels.

Mr. ROBINSON, Great Western Railway—I quite concur with the Secretary in his position. I think it would be a good thing for some of us to imagine that we are opposed in argument to draw the members out. For my part, I have watched these brakes and studied them with a great deal of interest. We have tried two or three brakes and have thrown them all away, and we are waiting for some other roads to take their share of the experiments before we decide. There is only one point I wish to refer to now which it may be useful to speak of, and that is this: If I had any doubt (I am not now speaking of the Westinghouse or any other particular kind of brake) that wheels were going to be skidded under the tender or the baggage cars or any other part of the train, that is if the cars were to be loaded at one time and empty at another, I would regulate the brake so that it could not skid them when the cars were loaded or empty; that is to say, if the brake is regulated as if they were all empty they could not skid the wheels on the train whether loaded or empty. I think a brake where the power is applied to all the wheels is more beneficial than where the brakes are applied to two or three cars, skidding the wheels; because it would be a partial braking up of every wheel instead of wholly braking up two or three wheels. As this can be done by the Westinghouse brake, it is only a question of mechanical skill, and I think it is unbecoming for us to think that we can't control a simple mechanical appliance of that kind without fearing the result on our rolling stock.

Mr. KELLER, Flint & Pere Marquette Railroad—The Westinghouse brake has been used six or seven months on our road, and during that time has never failed. I know that it has saved a great deal of property, such as cattle and horses, and probably many lives. We have had a collision since the report

was sent to the Committee from our road, when we know if we had not had the air brake we should probably have killed some passengers, and the cars would have been telescoped; but as it was they stopped and never broke a thing, while the engine was completely wrecked. I lay it all to the application of that brake. Before we adopted this brake, we tried the electric brake. I had some correspondence with Mr. Hill in relation to it; he recommended it very highly. We put it on to one train of four cars along side of a Westinghouse brake, running on the same train, or the same class of trains (I mean the Olmstead brake), and we did not make a successful trip on the trial. I think that it was owing to some mechanical defect in the machinery. I don't suppose but what the electric brake can be made to work, but that was the result of our experiment, and we adopted the Westinghouse brake, and have it on our entire equipment. So far as saving wheels is concerned, before putting it on I don't think there was a week but we had to change wheels; after we adopted it we stopped with less power on each wheel, avoiding the sliding, and we have not changed one wheel from that cause. I don't see any objection to trying other brakes. I would like to hear from gentlemen who have had experience with them.

Mr. EDVY, Boston & Albany Railroad—I would like to ask one question, not having had much experience with the Westinghouse brake; I would like to ask the question, if they are not somewhat complicated, and if the engineers don't find it constantly annoying them to keep the pump in repair; and if in consequence of that engineers on several of the roads have not asked the roads for?

Mr. BOOS, Pittsburgh, Fort Wayne & Chicago Railway—After two years experience I can state for the information of the gentleman, that any ordinary mechanic after a few days trial can thoroughly understand the whole management, and as for the trouble to the engineers, I have not got a man running it but would run for ten dollars a month less rather than have it taken off. When I first put them on, I put a man on to run them until they got used to them, and the men now take care of them themselves without any trouble or watching. They take care of them as much as any other part of the machinery; and the men who now run the passenger trains, if anything happens to their air brake, will not take their engines out until it is fixed. When we first put them on we put them on to two engines running fast trains; the two engines running opposite had none on, and the men came and offered to pay half the expense if the company would put them on to those engines. There is no train permitted over our line except air-brake trains. We find that men make better time. The States of Indiana, Ohio, Illinois and Michigan have stringent laws about crossings; we are obliged to come to a dead stop at every city of two thousand inhabitants, and are obliged to stop at railroad crossings; if we don't it is an offense punishable by imprisonment. With the old hand brakes the men commenced stopping two miles from the station or crossing; now they run up to the crossings and stop within the legal distance, two hundred feet. We find we can run our train the distance of 148 miles twenty minutes quicker than with the old hand brakes, and it makes a difference of forty minutes in our running time on the road.

Mr. HUDSON, Rogers Locomotive Works—Some time ago, by invitation of the Superintendent of the New York & New Haven road, I took a trip over that road for the purpose of seeing and reporting the working of the Westinghouse air brake, which they were experimenting with. I rode upon the locomotive and watched its operation, and rode upon the cars and watched the operation, to see that they didn't slide the wheels. Now I conceive that it is possible to arrange that brake so that the wheels cannot be slipped. Every engineer knows when he slides the wheels the resistance, so far as stopping the train is concerned, is less than when he does not slide them but holds back all he can without sliding them. Every brake ought to be arranged so it can be brought to a point that will not slide the wheels, and the Westinghouse brake succeeds, beyond any other brake which I have seen, in doing that with certainty every time. Where it is not done, it is only a matter which has been overlooked in putting it on and properly adjusting the leverage so that the wheels shall not be slipped. After watching the operation on that road and satisfying myself about all the points in relation to it I made a report to the Superintendent, that in my opinion it was decidedly the best brake for railroad purposes, taking everything into consideration, which it had ever been my opportunity to witness or become acquainted with. They felt as though they wanted all the information they could get; they had some little trouble at first with the pump not working right and with the air chamber not being regulated so they could get quickly a certain amount of pressure and no more, and they had trouble in a good many little things; however, they were things that were easily obviated, and I have no doubt at all, so far as I have seen brakes, that it is at the present time the best brake in use; and if I was about to run a locomotive as I have done in former years I should prefer it to any other I know of.

Mr. EDVY, Boston & Albany Railroad—One gentleman has answered the question which I asked, for which I thank him very kindly. I asked the question, and had a motive in asking it, and my motive in asking it was that we have had some little experience with the Westinghouse brake, and some three or four men that are running it have demanded or urged very hard that they should have extra compensation for running and taking care of that brake, and are very indignant that they do not get it. I am well aware of one or two other roads that have had the Westinghouse apparatus, and have set them aside or have not put them on, because of the understanding that men have demanded more pay where they have the Westinghouse air-pump to take care of.

Mr. SHAEVER, Pennsylvania Railroad—We have our road equipped with the Westinghouse brake; we run it on all our trains; it is on some 27 engines on my division, and we have few men on our road that would be willing to run without it. I have had them tell me, time and again within the last six months, they had rather pay ten or fifteen dollars a month out of their pockets than be without it. So far as the trouble is concerned in taking care of the pump, we have none; all you have got to do is to understand the thing and teach your men how to use it, and they can do it. We did not have any trouble with it.

Mr. COOLIDGE, Fitchburg Railroad—There is one point in relation to this matter that has not been touched upon—a point that I think ought not to be left out. In the report I am made to say that I do not believe in placing the braking power exclusively in charge of the engineer. I wish to explain that the road which I am connected with has used the Westinghouse brake for nearly a year; that road intersects, in going fifty miles, six different railroads, three of them double-track roads; at three of them the trains stop at a point as near as they can get. They make their first stop at a point of intersection with these other roads. Soon after using this brake I thought I saw what might be a source of danger from using them; that is, with a train making these stops, being under the control of one man, if he should fall it occurred to me the result would be disastrous. I saw an illustration of that one day at one of our crossings. The train came up (it was an accommodation train of about seven cars), and when it got within fifty feet of the crossing it was going comparatively slow, eight or ten miles an hour; of course I expected to see it stop without going any distance—I hardly thought it would go ten feet—but it gradually kept moving on until it went halfway over the crossing. It occurred to me if that should happen with a train upon the other track, the result would certainly be a loss of life. I mentioned the fact to our Superintendent, and he immediately issued an order that at these crossings the train

should be stopped by the brakemen, which regulation is in force now. That explains my part of the report. Our trains are wholly under the control of the engineer at other points except the intersection of other roads. Now it is generally conceded that the Westinghouse brake is more perfect than any other we have in use. It has been more fully tested. We may find something better, but it is generally admitted to be the best at the present time. With that exception, I think it is better to have the train exclusively under the control of the engineer. As to its efficiency, we will all allow if a train is controlled by five men, the engineer not only has the power of those five men, but of ten men more. We saw, some years ago, on the Pennsylvania road, a train going 25 miles an hour stopped in going its length. We saw that demonstrated at Altoona and other points on the road; but if you put that power in the hands of one man, what is going to be the result if he fails, from any cause whatever, at such a point as the intersection of another road? Some gentlemen have stated to me that they had seen in the papers that an accident of that kind had occurred, I think in New Jersey. That is all I have to say in regard to that point. Another point is in regard to engineers demanding more pay. I say that is of no consideration whatever; so in regard to the wear of wheels. This brake is intended for safety. The public demand it and will have it, and the expense of it is an after consideration. We are, as a body, trying to see what is the best thing. I don't say the Westinghouse brake is the best thing that ever will be, but I say that it is the best thing that has been so extensively tried and developed, and I think we will all agree that the best thing is what we want. The consideration whether the engineers demand more pay or not is of little importance. I think we shall find that intelligent engineers, after using that brake, will say, "I will not run if you don't give it to me." When an engineer has had the brake under his control, I think in ninety-nine times out of a hundred he will say, "I will not do without it," and will feel as if he was risking his life if he didn't have it. In regard to the wear of wheels, we might have almost an endless argument upon that. I certainly think, looking at it scientifically and mechanically, that we must admit it is better to stop a train with friction applied to every wheel just alike, than to have a strong man hero to a weak one there, and one man in the baggage car smoking and another doing his work. In regard to applying it to tenders, I grant it will be more work to make the locomotive repairs, but that is of no account. What matters it? We might as well wear out our tender-wheels as our car-wheels. On the road I am connected with, it is applied to the tenders; it does make more work and wears out the shoe faster and wears out the wheels some faster; but I consider those things are of no account. The mere amount of wages and the wear of wheels I consider of no account compared to the safety; that, in my estimation, is the only consideration.

Mr. SHAEVER, Pennsylvania Railroad—In regard to slipping wheels, we have some brakemen that don't appear to care how hard they draw the brakes if they only draw them up to the last notch. So with some engineers; but a good man on an engine will watch his gauge and put on two or three pounds of air, close his gauge, and put it on again. Then when he stiffens up he stops the whole train without sliding his wheels. A little instruction to the engineer in that respect would avoid a good many complaints, if there was any cause for any in sliding wheels.

Mr. SEDGWICK, Lake Shore & Michigan Southern—On the road with which I am connected we have eighty or ninety engines equipped with the Westinghouse brake, 250 cars, and we are making a mileage, with passenger trains, equal to about 10,000 miles per day. It has become a standing order, and I am not allowed to put an engine upon a passenger train without the air brake. As a matter of safety, with eighteen months experience with the brake, we find it the most efficient and the surest way to stop our trains. We have never had an accident, but we have saved a very large number of accidents, where, had we been without the brake, it is impossible to say what the result would have been. As a matter of economy, we find we make a large saving in wheels; instead of applying the brake to one-half of the wheels upon the train, it is applied to all, and, consequently, we make a more efficient stop and more reliable stop. Then as regards expense, we find it is much cheaper to use the brake than it is to use men for stopping the trains. For a train of twelve or fourteen cars we were obliged to run three or four brakemen; now, on those trains, we run but two, so it is very easy to see its advantages, as a matter of economy as well as safety.

Mr. SELLERS, late Des Moines Valley Railroad—I would like to give you a little word of explanation in regard to the Westinghouse brake, which is this: I see by the remarks that gentlemen have made, that all concede that the braking power distributed throughout the whole train is less destructive to that train than it would be if confined to only a portion of it; that is conceded. Whenever we have a mechanical problem to solve, we want, first, to take our hypothesis. Now we wish to produce a certain result, and in order to produce that, we must have first a power known; next, an equal distribution of that power, and then a perfect control of it; those are the only three conditions in the matter. With the Westinghouse brake you have a known, fixed power, a pressure of a certain number of pounds per square inch in your reservoir. You distribute that through the train by an elastic current of air; consequently, each car does its own work. If one car does not do the same work as another, it is a defect of the mechanical working; it cannot be otherwise, if it is in order, from the fact that this elastic current distributes itself.

Mr. PEDDLE, Indianapolis & St. Louis Railroad—I agree generally in the opinion of the gentlemen who have spoken in regard to the efficacy of that brake, but I think we ought to criticize it in every way possible. I would say, in answer to the question of Mr. Edvy, that a short time ago we advanced the wages of our engineers. An application was made, and one of the grounds was that the engineers did the braking. I think with the gentleman who has spoken upon that subject, that it is a very small matter; but still it is a fact. In regard to the expense of keeping up the brake, there is no trouble, whatever, about the engineer running the brake, but there is some trouble and expense in keeping up the brake; we find the pump apparatus is somewhat complicated. On our road—where we have fifteen engines and fifty cars—we find it takes one skillful mechanic about all his time to keep those pumps in order. We have been obliged to order extra valves, and keep them on hand for emergencies. In regard to the action on the road, a short time ago I made a trip on a road, and the first station we came to we ran about a car length past the station. Coming to examine into it we found the rear sleeping car, coming from New York—it was then 100 miles from St. Louis—had three or four holes punched into the hose, where it had dropped down on to the coupling, and had worn through the rubber. The engineer had put on his brake at the right point, but the pressure was dissipated so fast he could not get the train stopped. We have had one accident from the brake. The train was a long one, and the coupling link broke in two; the bell was rung by the cord pulling, and the engineer, supposing the conductor or brakeman had pulled the rope, put on his brake; the brakeman, not being called out by the usual signal, didn't go to the brake, and the train broke down. The starting signal now is one pull of the bell, and two pulls to stop the train; which partly obviates that trouble. I think I agree with the gentlemen, in the main, that it is the best thing that has so far been tried on railroads. I agree with them, but I think there are some defects in it. I understand there is a brake now in progress in Pittsburgh,

which I think some gentleman will explain here for the enlightenment of the Association.

Mr. WELLS, Jeffersonville, Madison & Indianapolis Railroad—I want to make one or two statements in reply to the question of Mr. Eddy in regard to engineers' demanding more pay for using that brake. We commenced the use of that brake more than two years ago, and we found the engineers at that time expected to be paid something extra for attention to it; but after they had used it a month or two and become familiar with it and familiar with its advantages, and saw they could not get along very well without it, they said nothing more about any extra pay, and all the other engineers, running similar trains, requested to have it put upon their trains, and said nothing about extra pay. I know there is no one of them that would be willing, under any consideration, to dispense with it on any of the fast trains. Now in regard to the wear of wheels. In my own observation I can state that the saving in the wear of wheels by the use of that brake has been 25 or 40 per cent. We all know you can carry a given pressure in those reservoirs by attaching a valve and allowing the excess of pressure or air to blow off; and when you require to use the brake, you have just the amount of pressure that is carried. The brake can be so adjusted that it will require nearly the entire pressure of the air in the reservoir to slip it; and, in making any ordinary stop, the engineer does not need to use the entire pressure, and consequently there is no sliding of wheels; but in case he is obliged to make a quick stop, he can put on the entire pressure and, at the same time, the wheels will scarcely slide; and when there is such an adjustment as that on the levers of the brake, the saving of wheels must be considerable. Now, in the old application of the hand brake, we all know, where there was one brakeman between two cars, he would do all the braking upon one car, until he had that set up tight; and until he had time to go and commence on the other car, there was one car out of the two that was doing all the work, while the wheels of the other were doing nothing; but by the application of the air brake or any other brake of that kind, that is avoided. The pressure upon every wheel in the train is alike, and as a consequence the pressure can be less upon the wheels in a given time to produce the same result than if it is applied on only one-half of the train. It cannot be very new to the mind of every mechanic, that an arrangement of this kind must far exceed in efficiency that of any other arrangement that has been in use heretofore.

Mr. GREGG, Erie Railway—I don't get up to talk about the importance of a better brake than the old-fashioned hand-brake. I think almost every intelligent mechanic in this room, I think the Association generally, will concede that we want a better brake than the hand-brake; and railroads, whether the expense be more or less, will be compelled by the traveling public to introduce a better brake than the old-fashioned hand-brake. I am glad to know that we have a better brake already introduced. There are several patent brakes now in use throughout the country, giving more or less general satisfaction. I have no doubt that road after road, throughout the entire country, will be, in a short time, equipped with a better brake than the old-fashioned hand-brake, merely because the traveling public will compel railroads to do it, whether they will or no; and I trust that master mechanics have intelligence enough to carry this work forward until the roads are all supplied with better brakes. I have been pleased with the ingenuity of Mr. Setchel in drawing out this discussion, by taking a false position; and then I was pleased that he did not allow that to go before the public as his opinion. My object in rising to speak here is to correct a mistake which was made in regard to Mr. Setchel's ingenuity suggested that very thought to my mind. I am made to say, in the morning paper this morning, that I favored the drilling of fine sheets and of boiler sheets, in place of punching them. Now I want the Association to understand that I favor no such thing at all, simply because I don't think there is any necessity for it. I don't want the Association to go away with the belief that I am going back and ignoring all my experience, for thirty years, in railroading; and hence I don't want the Association to believe that I favor drilling of boiler sheets. I simply said, that the experiments made by that Committee proved that the sheets were stronger drilled than punched. That was all. I don't propose to go back thirty years or more, and ignore all my experience, and commence where I commenced then. I don't propose to throw away steel tires and take up iron ones. I don't propose to throw away steel sheets for fire-boxes and use iron. And I think there are master mechanics here to-day who will live long enough to see the whole entire boiler made of steel in the place of iron, and will punch sheets too instead of drilling them.

Mr. ELLIOT, Ohio & Mississippi Railroad—There is one other point that I desire to talk upon in connection with the Westinghouse brake, and that is the consumption of fuel in running it—how much fuel it requires in addition. I would like to hear some of the members on that point. On our road, without going into any fine matter in relation to it, we have thought it took about twenty-five bushels of coal to work the brake over our road, over the entire line; that would be 140 miles. That is something that should be taken into consideration as a matter of expense. I would like to hear from any of the gentlemen who have tested the matter.

Mr. WELLS, Jeffersonville, Madison & Indianapolis Railroad—It seems to me we should close the debate upon this question before we commence anything else.

Mr. GLASS, Allegheny Valley Railroad—In reference to the brake referred to as having been got up at Pittsburgh, I will say, it is a vacuum brake, gotten up on the vacuum principle, and we have attained a vacuum of nine pounds and a half upon a cylinder twenty inches in diameter, giving us about 314 inches on the area of the head, equivalent to an atmospheric pressure of 4,000 pounds, which is applied direct to the brake lever. The vacuum is created almost as instantaneously as pressure can be got into the Westinghouse air cylinders. It is produced by a steam syphon. When danger is seen you draw the throttle, as you do of an engine or injector, and create a vacuum—and it is done almost instantly. We have tried it on our road on six cars, and in a distance of 300 feet, running 35 miles an hour, with a large engine, we have brought it to a dead stand; and with the same engine, on the same occasion, the engine with the throttle wide open, with a pressure of 120 pounds, it was brought to a dead stand in an incredibly short distance. These are got up very cheap, and no doubt will be very effective. I desire to make the announcement, that as many of the members as can take the trip on Saturday will see it on the train that is being equipped for the occasion.

Mr. ROBINSON, Great Western Railway—There are a very large number of mechanics here to-day who are using the Westinghouse brake, and I would like to ask if the objection which I have heard against it, in regard to releasing the brake, has been overcome entirely? That is a serious point in the consumption of fuel. I have been told that, after the brake has been put on, when the train is ready to start, some of the brakes are found touching, and that there is a large amount of power required to overcome unnecessary friction. I am told it has been partly overcome on some roads, while others have not succeeded in overcoming it. It is a serious question, and I should be pleased to hear that it is entirely overcome.

Mr. GRANT, Rockford, Rock Island & St. Louis Railroad—I will state that Mr. Wilson, of Galesburg, has recently patented a valve, by which he has entirely overcome that trouble, so that he releases it entirely, and it is done almost instantly.

Mr. KELLER, Flint & Pere Marquette Railroad—In regard to overcoming the friction, we have adopted a little syphon, to take the air from the reservoir, the same as a steam syphon.

After the pressure has relieved itself from the cylinder, you turn a little cock, and in an instant every piston will go right back.

Mr. MAYNES, Selma, Rome & Dalton Railroad—We have heard of one or two different brakes here—the Vacuum brake and the Westinghouse brake. I would inquire if any member has had any experience with the Goodale brake? We have not adopted any brake on our road, and have been in correspondence for that purpose.

Mr. FORNEY—I would like to call attention to a little experience I had on a train equipped with the Westinghouse brake, and inquire whether some modification should not be made to meet that difficulty. Coming over the Pennsylvania road a when the engineer, owing to the breaking of the signal bell cord, applied the brakes to the front end of the train, and the rear cars being disconnected from those in front ran into the latter and broke the platforms. This, it seems to me, is a difficulty with this brake which could be obviated by the exercise of a little thought and ingenuity; and I have therefore suggested it so that those present may be induced to think about it.

With reference to the merits of the Westinghouse brake I am not prepared to say there will not be something better, year and a half ago, the train broke in two on a down grade; but I am prepared to say, so far as my observation has gone, that it is the best thing in use at the present time.

Mr. GLASS, Allegheny Valley Railroad—The difficulty suggested by Mr. Forney has been provided for in this vacuum brake. They use a rotary pump in the caboose of the train, and by working that by hand, or working it from the axle, the vacuum is produced equal to that produced by the steam syphon, and if the train parts, that can be applied, and the train brought to a dead stand.

Mr. WELLS, Jeffersonville, Madison & Indianapolis Railroad—I would like to ask Mr. Glass, whether that application to the rear of the train depends upon the attention of some one person there, or will it apply itself automatically.

Mr. GLASS, Allegheny Valley Railroad—It is intended that the conductor, or rear brakeman, or flag-man shall look after that.

Mr. WELLS, Jeffersonville, Madison & Indianapolis Railroad—Then if he goes to sleep, or is not there to attend to it, it is not any better than if it was not there?

Mr. GLASS—No, sir.

On motion of Mr. Chapman, the discussion on this subject was closed, and the Association took a recess of ten minutes.

British Rail Exports.

Heyerdahl, Schönborg & Co. supply the following monthly report of exports of railway iron from Great Britain, extracted from Government returns:

To	Month ending June 30.			6 months ending June 30.		
	1870. Tons.	1871. Tons.	1872. Tons.	1870. Tons.	1871. Tons.	1872. Tons.
United States..	46,065	44,919	37,978	197,045	244,784	259,011
Russia.....	36,988	32,731	7,911	114,454	46,929	21,064
Austrian Terr.	3,585	3,645	.....	19,187	5,510	6,275
British India..	15,472	1,732	2,139	102,564	26,766	6,624
Brit. N. America	3,495	12,566	10,032	15,649	37,379	28,298
Egypt.....	.....	183	40	1,584	646	10,167
Australia.....	446	1,546	9,928	10,468	10,847	10,847
Brazil.....	48	3,126	3,260	2,318	11,615	12,497
Holland.....	1,828	1,858	170	11,884	5,729	2,117
Spain & Canar's	1,039	799	637	9,030	5,568	6,135
Sweden.....	91	993	1,569	1,483	3,120	7,683
Chili.....	3,632	3,170	407	9,395	5,490	1,352
Spanish W. I. Isl.	6-4	1	.....	2,338	534	633
Peru.....	2,457	4,957	3,318	8,892	12,944	21,491
France.....	36	110	159	1,030	.....	332
Germany.....	6,687	7,509	2,009	31,815	32,230	16,723
Other countries	3,098	7,407	7,644	30,317	35,801	87,004
Total.....	125,474	108,152	81,164	562,709	476,191	468,042
Total exports from Gr. Britain of iron & steel to all countries.....	318,581	313,872	319,159	1,481,100	1,440,193	1,674,708

It will be seen that 58 per cent. of the total exports of rails for the half-year were to the United States, and that its imports are about 6 per cent. more than last year. The great advance in price will probably account for the falling off of about 18½ per cent. in the June imports.

Report of the Leavenworth, Lawrence & Galveston Railroad Company.

The Superintendent and Chief Engineer, Mr. O. Chanute, reports as follows for the fiscal year ending April 30, 1872:

At the date of our last report, the road was in operation to Thayer, 108 miles south of Lawrence, or 134 miles from Kansas City. Construction had just begun for its extension to the State line. This was pushed with vigor, and the road opened to Cherryvale July 10, and to Coffeyville and the south line of Kansas August 28, 1871.

Arrangements having been made to build a branch to Parker, 1½ miles, and to undertake the construction of so much of the Southern Kansas Railroad as lies between Cherryvale and Independence (the county seat of Montgomery County), the former was opened on the 1st of November, and the latter on the 31st of December, 1871.

The system now operated by this company consists of the following:

Leavenworth, Lawrence & Galveston Railroad, main line—	
Lawrence to State line.....	144.16
Leavenworth, Lawrence & Galveston Railroad, Parker Branch—	
—South Coffeyville to Parker.....	1.80
Southern Kansas Railroad—Cherryvale to Independence.....	9.70
Kansas City & Santa Fe Railroad—Ottawa to Olathe.....	31.91
Missouri River, Fort Scott & Gulf Railroad, joint track—	
Olathe to Kansas City.....	21.60
Total.....	208.57

The average number of miles operated during the year, over this company's own lines, amounts to 169½ miles, and, including the joint track, used in common with the Missouri River, Fort Scott & Gulf Railroad, to 190½ miles.

These extensions have been completed in the same style of excellence as the remainder of the road constructed by the present management, and fully up to first-class Western standards.

The ruling maximum grades are 45 feet per mile, and the curves of long radius. The embankments are from 14 to 16 feet, and the cuts 20 feet wide at grade; while much greater care than is usual has been paid to thorough drainage. In grading the line, the stone from the rock cuts was saved and deposited on the sides, and no less than 20 miles are already ballasted with broken stone. The track is laid of 57-pound rails, well fished at the joints, and resting on about 2,700 white oak and black walnut ties per mile. It is safe to run at the rate of 60 miles an hour over any part of it.

The stations, appointments and rolling stock are fully up to the same standard of excellence in character, and all passenger trains are equipped with Miller's platforms and couplers and with Westinghouse's atmospheric brake.

The amount of the equipment now on the road is as follows:

Rolling Stock.	On Road April 30, 1871.	Added during the year.	Now on Road.	Per cent. per mile of Road.	Miles of Road to each.
Engines.....	16	4	20	0.096	10.4 to 1
Passenger coaches.	8	2	10	0.048	15 to 1
" Smoking cars.	4	..	4	0.019	"
Baggage cars.....	3	3	6	0.024	"
Mail and Ex. cars..	4	..	4	0.019	23 to 1
Caboose way cars..	4	3	7	0.033	"
Box cars (combn'd)	145	20	165	0.793	0.79 to 1
Flat and coal cars..	90	..	90	0.434	"
Wrecking cars.....	1	..	1	0.005	208 to 1
Hand cars.....	28	8	36	0.174	5.78 to 1
Rubble cars.....	28	4	32	0.154	6.5 to 1

This is barely sufficient for the present business. If this increases as it is believed it will, additions will be required from time to time, and probably 50 or more box cars before the end of the year.

The country through which the road runs is a fertile, attractive prairie region, well watered, and sufficiently supplied with timber for all farming operations. The substratum of the soil is limestone. It is, as yet, comparatively thinly settled, the eastern tier of counties in Kansas having received the earlier emigration to the State.

The length through each county, the population, resources and debts of the tributary country to this line are as follows:

COUNTIES.	Length of Railroad in Miles.	Area in Square Miles.	POPULATION.		Inhabitants per Square Mile.
			Census, 1870.	Estimated 1871.	
Douglas.....	18.94	470	20,555	23,000	50
Johnson.....	16.49	473	13,685	15,000	32
Miami.....	2.00	..	..	..	..
Franklin.....	38.14	576	10,406	12,000	21
Anderson.....	27.99	876	5,225	6,000	9
Allen.....	21.39	504	7,044	8,000	14
Neosho.....	24.67	576	10,223	13,000	22
Wilson.....	..	684	6,493	10,000	16
Labette.....	1.94	..	..	..	..
Montgomery.....	36.91	624	7,638	15,000	24
Totals.....	187.57	4,422	81,349	103,000	23

COUNTIES.	Number of Acres Assessed.	Value Assessed per Acre.	Taxable Property as fixed by State Board, 1871.	Bonded Debt for all Purposes.
Douglas.....	287,608	\$11 17	\$7,347,460	\$940,000
Johnson.....	322,065	9 07	3,408,259	325,000
Miami.....	..	..	..	..
Franklin.....	341,747	8 00	3,239,232	331,000
Anderson.....	337,385	5 50	2,569,235	200,000
Allen.....	137,003	5 59	1,851,302	210,000
Neosho.....	124,835	5 20	1,618,752	131,000
Wilson.....	90,484	4 74	946,821	..
Labette.....	..	..	..	..
Montgomery.....	3,591	3 00	716,963	24,000
Totals.....	1,553,718	..	\$21,816,044	\$2,387,000

This population is rapidly increasing, no less than 22,000 new settlers having been added during the year. The country is so attractive that should Kansas continue to be favored with the splendid crops of the past few years, it must, in a short time, afford a remunerative traffic. Every effort is being made to invite emigration to this portion of the State, and to promote the development of the country.

The earnings and operating expenses during the past fiscal year, upon the average of 190 42-100 miles operated, have been as follows:

Gross Earnings and Expenses.	Amounts.	Per Mile of Road.	Per Mile run by Trains.
Earnings from Freight.....	\$322,978 49	\$1,696 14	1 99
" " Passengers.....	238,499 2	1,233 49	"
" " Mails.....	20,266 62	106 43	"
" " Express.....	10,229 79	53 68	1 22
Miscellaneous.....	2,035 76	10 64	"
Operating expenses, 66 per cent.....	\$598,992 87	\$3,119 38	Avg'e, 1 35
Net earnings.....	\$198,313 95	..	..

The operating expenses have been increased by the transportation of materials for the extension of the road, the volume of which has been nearly 22 per cent. of the whole tonnage carried.

The following statistics are deduced from the returns made by the various departments:

FREIGHT.	
Number of miles run by engines on freight trains.....	161,669
Tons carried one mile.....	8,148,258
Total tonnage capacity of freight cars hauled one mile..	14,673,310
Total tons of dead weight and freight hauled one mile...	22,954,233
Proportion of full loads for cars to total hauled.....	55 per cent.

PASSENGER BUSINESS.	
Number of miles run by engines on passenger trains....	221,220
Number of paying passengers carried one mile.....	4,502,295
Number of free passengers carried one mile.....	865,702
Total number of passengers carried one mile.....	5,368,097
Total number of seats one mile.....	25,125,365
Average proportion of seats filled.....	21½ per cent.

Proportion of free passengers to total..... 16 " " As the road has a double northern terminus, at Lawrence and at Kansas City, and through cars have to be run to both cities, more passenger accommodation is furnished than would be otherwise required.

It will also be noticed, from the table of commodities carried, that 68,692 tons were transported southward, and only 16,258 tons, or less than one-quarter, northward. This result is incident to the settlement of a new country. Immigrants import lumber, supplies of various kinds, and food, and have nothing to export. These causes greatly increase the percentage of cost of operating expenses.

During the past year a bridge has been built over the Kansas River at Lawrence. This structure consists of four spans of Howe Truss, 150 feet each, resting upon wooden piers, and, with the approaches, has cost about \$70,000.

The city of Ottawa having voted \$60,000 in city bonds, and

furnished twenty acres of ground, to be used in the construction of machine shops at that point, some 22 acres more have been secured by gift and purchase, and arrangements are now being perfected to go on with the work, so that this much-needed accommodation may be furnished before next winter.

In closing, permit me to return my thanks for the valuable assistance furnished to me by the heads of the various departments, and to call your attention to the fidelity and zeal with which the agents and employees have, all alike, performed their services in the operation and construction of the road.

The report of the President, Mr. James M. Walker, which recites many of the facts contained in the Superintendent's report, says that the ten miles from Cherryvale to Independence were built from the proceeds of \$75,000 of city and township bonds of Independence donated for the purpose, and from the proceeds of \$160,000 of 8 per cent. 20-year bonds of the Southern Kansas Railroad Company. The Leavenworth, Lawrence & Galveston Company has a perpetual lease of the line, the rental being the interest on the \$160,000 of bonds (\$12,800 yearly) and the provision of a fund for the purchase of the bonds in the market by setting aside 40 per cent. of the gross earnings on the main line from all traffic received from the leased road.

The company uses the 21 miles of Missouri River, Fort Scott & Gulf road between Kansas City and Olathe for through traffic, by paying half the cost of maintenance and 10 per cent. on half the cost of the road. It uses the depot grounds in Kansas City, one-fourth of which it owns, in common with the same company, and they are to be improved at their joint expense.

The company sold during the year 42,539.42 acres of land at an average of \$8.15 per acre, making the amount, with the receipts of town lots, \$361,079.20. Sales were interrupted by a question as to the validity of the company's title to the Osage Ceded Lands, which has been fully confirmed, the patents having been granted. It is hoped that now the land will sell more rapidly.

The assets of the company are:

Balance due for lands sold to date	\$440,660 84
418,969 acres of land and estimated value of town lots	3,275,727 14
County and township bonds (par value)	1,319,400 00
	\$5,065,787 98

Construction of main line, 145 miles of road	\$4,300,319 97
Construction of K. C. & S. F. R. R., 33 miles of road	913,623 05
Construction of Southern Kansas R. R., 10 miles of road	164,298 03
Equipment	694,364 35
	\$5,982,515 41

Operating Accounts:	
Due from postoffice department	\$ 8,843 43
Due from agents and foreign roads	64,307 52
Materials on hand paid for	15,866 27
Balance in treasury	36,203 99
	125,119 21

Total	\$11,173,422 60
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LIABILITIES.

Partial Debt:	
L. & G. R. R. Bonds	\$3,000,000 00
K. C. & S. F. R. R. Bonds	730,000 00
Southern Kansas R. R. Bonds	160,000 00
	\$3,890,000 00

Operating Accounts:	
Bills and Accounts Payable	278,616 12
Total	\$6,158,616 12

Surplus	\$5,014,806 48
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The capital stock stands at \$5,000,000.

The capital stock and bonded indebtedness of the company have each been increased one million of dollars during the year by the issue and sale to the stockholders, *pro rata*, of one million dollars of capital stock and the remaining one million of bonds authorized and secured by the trust mortgage, originally executed by the company on its road and assets, for 90 per cent. of the face of the bonds. The proceeds were expended in the extension and construction of the road from Thayer to the State line, and in purchase of additional equipment, and paying other liabilities incurred on account of construction.

The gross earnings were \$593,992.87, and are in excess of those of last year \$69,901.81. The excess is really about \$145,697.00; last year the freight on construction material having been included at full rates in statement of earnings, to the amount of \$75,795.19.

The operating expenses were \$395,678.92. The ratio of expenses to earnings this year, as compared to those of last, is as 66 to 83 per cent. Two circumstances have combined to prevent the reduction of operating expenses to the neighborhood of 50 per cent., as it was hoped might be done: one the transportation of a large amount of construction freight carried over the road, and not charged in income account; the other the fact that the increase of business during the year has not kept pace with the increased length of the road operated; the average length of road operated last year being only about 94 miles, while this year it has been about 169 miles, excluding the part of the Fort Scott road operated by this company.

"Business on all Kansas and other Western roads has been light during the year, and while the earnings on your road have not been as large as was expected at the commencement, in consequence of the difficulties we have mentioned, created by the settlers on our lands, thereby preventing not only their improvement, but the settlement of the country, and in consequence of other causes common to the whole West, yet they are in amount sufficient to show that you have not over-estimated the value of your property.

"While nearly one-fourth of the population now upon lands along and tributary to your line have been added during the last year, as shown by the statement of the Superintendent, yet not more than one-tenth of these lands are yet in production.

"Double this amount, which, at a slight increase of the ratio of emigration of last year and consequent improvement, would be done at an early day, and your road will earn enough to pay its interest, on the supposition that it can be operated at about 50 per cent. of the gross earnings, as would certainly be the case under such circumstances.

"Treble the amount of lands in production to three-tenths, which must be done at no distant day, and you are receiving an income on your investment.

"In the meantime, to provide for deficiencies in the earnings of the road to meet the interest on its bonded indebtedness, this company finds an adequate and ample resource in the \$1,349,400 of county bonds mentioned in the Treasurer's report. So far as may be necessary, these bonds will be sold during the present and succeeding year, should the lack of earnings make such a disposition of them necessary."

PERSONAL.

—Colonel A. G. Gower has resigned his position as Superintendent of the Western Division of the St. Louis, Kansas City & Northern Railway. It is reported that he will receive an appointment on an Indiana railroad.

—Mr. George L. Dunlap, for many years and until lately General Superintendent or General Manager of the Chicago & Northwestern Railway, and now a member of the firm which has the contract for the construction of the North Shore Railway of Canada, was married recently

to a daughter of ex-Mayor J. B. Rice of Chicago.

—Mr. Frank Wyatt, formerly of Oskaloosa, Iowa, is acting as Superintendent and Engineer of the Atchison & Nebraska Railroad, in place of the late F. R. Firth.

ELECTIONS AND APPOINTMENTS.

—At a meeting of the stockholders of the Grand Island & Northwestern Railroad Company, at Omaha, July 16, the following board of directors was elected: T. E. Sickels, A. J. Poppleton, J. W. Gannett, Thomas L. Kimball, H. W. Koenig, J. H. Millard, and N. Shelton. The board of directors subsequently elected the following officers: President, A. J. Poppleton; Treasurer, H. W. Koenig; Secretary, O. F. Davis; Chief Engineer, T. E. Sickels; of these Messrs. Sickels, Gannett, Kimball and Davis hold positions in the Union Pacific Company.

—O. W. Lampert, for some time Secretary to Superintendent Wright, of the Lake Shore & Michigan Southern, has been appointed Truck-Master of the Waukegan section, in place of Mr. W. Wheaton, who was lately made Superintendent of Kalamazoo Division.

—Mr. L. S. Hamilton, formerly a conductor on the Missouri, Kansas & Texas Railway, has been promoted to the position of Superintendent of the Neosho Division, (Junction City to Parsons), with headquarters at Junction City.

—At the adjourned meeting of the stockholders of the New York Western Railway Company, held in Cedar Rapids, Iowa, July 10, 1873, for the election of a board of directors, the following gentlemen were elected: Geo. Greene, John F. Ely, James E. Abbott, R. S. Swiggins and Wm. H. Merritt for three years. Wm. Greene, Jas. L. Bever, W. H. Pettibone, E. V. Bronson and R. G. Pennington for two years, and Francis W. Hughes, Henry Clews, Thos. H. Benton, Jr., J. C. Brooksmit and Edward M. Greene for one year.

—At a meeting of the shareholders of the Canadian Railway Equipment Company the following gentlemen were elected directors, viz.: Sir Hugh Allan, E. H. King, George Stephens, T. W. Ritchie, Hon. D. A. Smith, Sir A. T. Galt and R. J. Reikie. Sir Hugh Allan was afterwards elected President, and Mr. George Stephens, Managing Director.

—The annual meeting of the stockholders of the Connecticut Western Railroad Company was held at Hartford, July 16, and the following persons were chosen as directors for the ensuing year: William H. Barnum, George M. Bartholomew, George W. Moore, Charles R. Chapman, Byron Loomis, George Dudley, Frederic Watson, Alexander H. Holley, James L. Howard, Nathaniel B. Stephens, Jonathan B. Bunce, William L. Gilbert and Egbert T. Butler, all of the old board.

—The stockholders of the Middlesex Central Railroad, at a meeting July 20, elected the following board of directors: C. W. Bellows, of Pepperell, Mass.; Andrew Roberts, of Groton; Gardner Prouty, of Littleton; George Keyes, of Concord; Thomas Stiles and Henry Wood, of Bedford. The board elected C. W. Bellows, President; and George Keyes, Treasurer.

—Henry Prentiss was chosen Secretary and Treasurer of the White Water Valley Railroad Company in place of William C. Perkins, resigned, at a meeting of the directors, July 12.

—The new board of directors of the Michigan Lake Shore Railroad Company, elected July 18, is as follows: G. W. Cass, J. N. McCullough and Thomas D. Messler, of Pittsburgh; Thomas A. Scott, of Philadelphia; S. J. Tilden, of New York; Joseph Fisk, of Allegan, Mich.; E. P. Ferry, of Grand Haven, Mich., and L. G. Mason, of Muskegon, Mich. All these are re-elected, except Thos. D. Messler, who takes the place of B. Ledebour. Subsequently Thos. D. Messler was chosen President; Joseph Fisk, Vice-President, and W. R. Shelby, of Grand Rapids, Secretary and Treasurer. Mr. Fisk, now Vice-President, was last year President. Mr. Shelby is re-elected.

—The Springfield State Journal reports that the Governor of Illinois has commissioned Alexander Starne, of Sangamon, Hugh Fullerton, of Mason, and David J. Waggoner, of Fulton County, as directors of the Springfield & Northwestern Railroad Company, on behalf of the State of Illinois.

—At the first meeting of the new board of directors of the Erie Railway Company the following committees were appointed, the President, *ex officio*, being a member of each:

Executive Committee—Messrs. Diven, Duncan, Morgan and Barlow.

Finance Committee—Messrs. Cisco, Lansing, Babcock and Travers.

Committee on By-Laws—Messrs. Barlow, Pruyn and Johnston.

Mr. W. Watts Sherman resigned his position as Treasurer, but the election of his successor was postponed. All appointments of counsel and attorneys were revoked, and the law firm of Barlow, Larocque & Macfarland was appointed at a salary of \$10,000 per year.

—At the annual meeting of the Grand Rapids & Indiana Railroad Company, held at Grand Rapids, July 17, the following directors were elected: W. A. Howard, H. J. Hollister, George H. White, of Grand Rapids, Mich.; J. G. Waite, of Sturgis, Mich.; Andrew Ellison, of La Grange, Ind.; F. P. Randall and Piny Hoagland, of Fort Wayne, Ind.; J. N. McCullough, Thomas D. Messler and Springer Harbaugh, of Pittsburgh, Pa.; Perry Hanna, of Traverse City, Mich.; Charles H. Bond, of Franklin, Mich.; and Mancel Talcott, of Chicago. Of these Messrs. Hanna, Bond and Talcott are new directors, replacing Messrs. B. M. Hanks, of Big Rapids, Mich., and Joseph K. Edgerton, of Fort Wayne. Hon. Wm. A. Howard was subsequently re-elected President, and W. R. Shelby, Secretary and Treasurer.

—Joseph Gaskill, for three years Cashier of the Rockford, Rock Island & St. Louis Railroad, has been sent to Frankfurt, Germany, as Transfer Agent, and Wm. Truesdale takes his place as Cashier.

—Circular No. 1, from Charles C. Smith, the new Superintendent of the Sheboygan & Fond du Lac Railroad, announces, under date July 8, that "Mr. L. A. Emerson, having been appointed Train Dispatcher, Paymaster and Purchasing Agent, his orders concerning the movement of trains, the distribution of cars and the government of trainmen will be respected and obeyed. All supplies will be purchased by him, and furnished to the different departments, upon proper requisition.

"Mr. L. S. Hough has been appointed General Passenger and Freight Agent."

Mr. Emerson was previously the Ticket Agent of the road, and Mr. Hough the Freight Agent. Mr. Smith himself was lately Resident Engineer of the Leavenworth, Lawrence & Galveston Railroad.

—The Illinois, Missouri & Texas Railroad Company (late the Cape Girardeau State line), at a recent meeting in St. Louis chose the following directors: E. J. Crandall, Gen. C. B. Fisk, A. V. Bohne, B. R. Bonner and J. D. Slocum, of St. Louis; W. W. Mann and C. M. Randall, of New York; J. Dougherty, of Illinois, and Thos. Johnson, of Cape Girardeau, Mo. E. J. Crandall was chosen President in place of Nathan Randall, of New York, deceased; W. W. Mann, Vice President; and W. K. Goodrich, Jr., Secretary.

—Mr. John E. Simpson, General Superintendent of the Vandalia Line, has been chosen Secretary of the Western and Southern Railway Association, in place of J. H. Sheldon, resigned.

Louisiana & Missouri River.

The Supreme Court of Missouri has decided that the subscription of \$400,000 to this company by Saline County is illegal and void, and has granted a perpetual injunction restraining the county officers from issuing bonds for the subscription. The chief contest, perhaps, was on the question whether the State can bring action before any bonds have been issued by the county. The court affirmed this right. It was also decided that a county not on the line of a railroad cannot subscribe aid to that road, and that all such subscriptions must be made by a two-thirds vote of the people of a county, and not by the County Court (which has both legislative and administrative powers in its county to some extent). We believe that little or no work has been done on the extension of this road from Mexico westward, as was intended when the lease to the Chicago & Alton was made. The latter company has now little use for such an extension, and as the loss of this subscription may prevent the lessor from carrying out its part of the contract, the Chicago & Alton may be under no obligations to endorse the bonds. Meanwhile the extension from Mexico south to Jefferson City has been completed, making the entire line in operation from Louisiana to Jefferson 101 miles long.

We condense from a Kansas City paper the following abstract of the decision:

The Supreme Court of Missouri has given its decision in the case of the bonds issued by Saline County to this road. The Louisiana & Missouri River Railroad Company was chartered in 1859, and authorized to build a railroad from Louisiana, in Pike County, westwardly to the Missouri River. In 1868, an act amendatory to this was passed, extending said road on the south side of the river to Kansas City, passing through Saline County. This amendatory act gave to County Courts the power to subscribe to the stock of said road. The new constitution of 1865 prohibits such subscriptions, except by submission to a vote of the people, ratified by two-thirds. The County Court of Saline subscribed to the stock without such submission. A suit to prevent the delivery of the bonds was instituted through the Circuit Attorney, on behalf of the State, and the case, after hearing in the Circuit Court, was taken to the Supreme Court of the State. The Supreme Court consists of Judges Wagner, Bliss and Adams, but Judge Adams having been attorney in this case, previous to his elevation to the bench, was disqualified from sitting in the case, and Mr. J. R. Shepley, of St. Louis, was sworn in as a special judge to sit on this case. There were two points raised in the pleadings—the right of the State to be a party to the suit, and the legality of the subscription.

Mr. Shepley in his opinion holds that the suit was properly brought. Judge Bliss concurs with him, and Judge Wagner dissents. This point is thus decided. Mr. Shepley holds that the amendment act being of a date subsequent to the adoption of the present Constitution, the County Court of Saline County could not make the subscription without the vote of the people, and that the subscription was void. In this opinion both Judges Wagner and Bliss concur. No other point has been decided in the case, the court going no further than the question raised by the pleadings. Mr. Shepley goes to the extent of saying that the whole amendatory act is illegal and void, and that the company have no right in law to build a road south of the river at all. Judge Wagner dissents from this opinion in toto, and Judge Bliss, while conceding that the Legislature has the power of amendment, yet as this question was not raised in the case before the court, he, in terms, declines to express an opinion. This point then is still undecided. In order to test this last point, a motion has been entered by Judge Fagg, attorney for the company, for a rehearing of the case. The status of the company now is, that its right to build a road to Kansas City remains, but its subscriptions from the counties and cities must be made through a two-thirds vote of the people. By this decision the first subscription of \$250,000 to the road, made by Jackson County, is void; the second subscription of \$200,000 was submitted to a vote of the people and carried, but may be defeated on technical grounds, as it was ordered merely for instruction of the County Court.

International Railroad.

Superintendent Hoxie announces the opening of this road for traffic, July 11, as far as Palestine, Texas, 95 miles northeast of Hearne. At Palestine the El Paso Stage Company connects with stages for Longview, the western terminus of the Southern Pacific, and also a line of stages to Jacksonville, Texas.



Published Every Saturday.

A. N. KELLOGG & CO., Proprietors.

S. WRIGHT DUNNING AND M. N. FORNEY, Editors.

W. H. BOARDMAN, Acting Publisher.

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Editorial Announcements.

Address.—The RAILROAD GAZETTE will be printed for the present in New York; our printing house in Chicago having been destroyed. All communications, therefore, whether editorial or business, should be directed to the New York office. The proprietor will receive subscriptions and advertisements at his office in Chicago, Nos. 63 and 65 South Canal street, but letters should be addressed to New York.

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, except in the advertising columns. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

THE CHICAGO, BURLINGTON & QUINCY.

The Chicago, Burlington & Quincy Railroad Company is the fourth of the Chicago roads from which we have reports for the year including the Chicago fire. When we say "Chicago roads," we mean those which bring agricultural produce to Chicago—those entering, passing through territory tributary to Chicago and not east of it. This definition includes the new Chicago, Danville & Vincennes road, and all lines west of it and of Lake Michigan which enter Chicago. The other roads which enter Chicago are routes from that city to the East, and their traffic and relations are quite distinct from the others.

Of the four Chicago roads, then, the Chicago & Alton, with some increase in mileage, showed a small decrease in earnings; the Illinois Central, with no change in mileage, also showed a small decrease in earnings; the Chicago, Rock Island & Pacific, with an increase in mileage, showed a small decrease in earnings, and now we have the Chicago, Burlington & Quincy, with a large increase of mileage (more than 18 per cent.), showing a small increase in earnings (5 per cent.). Taking the receipts per mile, the decrease becomes striking, it being from \$11,227 in 1870-'71 to \$9,969 in 1871-'72—no less than 11 per cent. It was not to be expected, of course, that the new branches, some of them of slight importance, and taken chiefly because they could be got with little expense, and in any other hands might be directly injurious, should have anything like the average traffic of the old lines. But, with due allowance for this, there can be no doubt that the receipts of this company, as of the four others that have reported, have relatively declined.

All these lines, it is worth mentioning, operate in the district south of the latitude of Chicago, in the district of the most varied and bulkiest products, from which come by far the largest part of the corn, cattle, hogs and winter wheat that are marketed at Chicago. All, too, are more or less affected by the competition of the numerous lines, mostly new, which take Western produce eastward to Toledo and by all-rail routes to the consum-

ing districts and exporting cities of the East; the Rock Island being least affected by this competition, the Burlington & Quincy much more, and the other two feeling it on a large part of their lines.

The average mileage of the Chicago, Burlington & Quincy for the year reported (ending April 30, 1872) was 759½ miles, against 642 for the previous year. At the close of the year it operated 784 miles of road, the lines added during the year being the northern (and not very useful) end of the Fox River Valley line, from Aurora to Geneva, 11½ miles, and the extension of the Illinois Grand Trunk road from Prophetstown to the Mississippi opposite Clinton, Iowa, about 18 miles. Of the total mileage operated 403 miles is owned by the company and the rest leased, though it has a large interest in most of the leased lines.

The gross earnings for the year were \$7,569,009.58, and increase of \$361,324.38, over the earnings of the previous year. There was a trifling decrease in the passenger receipts (\$5,760.30), and an increase of \$350,180.53 in the freight receipts, a trifle more than 7 per cent. The operating expenses, including taxes, were \$4,949,832.75 against \$4,428,674.43 the previous year; so the net receipts were less by \$159,833.94, the proportion of working expenses to earnings being 61.35 per cent. the former and 65.35 the latter year.

If we pass from receipts to traffic, we find that not only is there an increase but a large increase in the tonnage hauled, amounting to 16½ per cent., while the increase of receipts from freight was only 7 per cent. This is the tonnage mileage; the absolute number of tons hauled, without regard to distance, was still greater—22 per cent. One of the causes of the reduction of rates received for hauling freight, strange as it may seem, was the Chicago fire. The country on the line of the road, not being able for some time to obtain the usual supplies of merchandise from Chicago, made its purchases in Eastern cities; and on the merchandise so brought, which passed over this road the same as if it had been shipped at Chicago, the company received only its proportion of the through rate from the point of shipment, instead of the usual local rates.

The passenger traffic was almost unchanged in bulk as well as in receipts.

The difference between the receipts of the main line and branches is very striking. The main line earned at the rate of \$17,231.59 per mile—more probably than any other line so far West; while the average receipts per mile from the branches (some old and well established) was about \$4,500 per mile. However, these branches supplied traffic to the main line from which 22½ per cent. of its gross earnings was obtained, so their indirect value is obvious. Estimating the cost of operating the leased lines at 60 per cent., the net earnings from traffic over them was \$143,813.34 more than the interest on their bonds.

The traffic carried to and received from the western connections of the road shows some notable changes. There is a large decrease in the Hannibal & St. Joseph business, amounting to 15 per cent. in tonnage and 31½ per cent. in freight earnings, caused doubtless by the decrease in Kansas traffic in part, but chiefly by the division of and fierce competition for that traffic. There was also a decrease of about 10 per cent. in Illinois Central traffic, the decrease in tonnage being only 3½ per cent. On the other hand, there was an increase of 27½ in tonnage and of 17½ per cent. in freight earnings in Burlington & Missouri River business, and an increase, too, of 13 per cent. in receipts from passenger traffic to and from that road.

The construction of several friendly connecting lines, which will bring the road traffic, is noted, among them the 60 miles of the Chicago, Pekin & Southwestern from Streator to Pekin, and the 30 miles of the Fairbury, Pontiac & Northwestern (now Chicago & Paducah) which it is intended to extend to the Ohio River—both of which will feed the Fox River Valley Branch. Then there are the Iowa Southwestern and the Chicago, Clinton & Dubuque which will send their traffic over the new Mendota & Clinton line; and the Chicago, Dubuque & Minnesota (which has itself several branches under way), whose traffic will pass over the Illinois Central to Forreston, the Chicago & Iowa to Aurora, and the Chicago, Burlington & Quincy to Chicago, the latter company having, as this report announces, control of one-half of the Chicago & Iowa stock. It is also announced that the Chicago & Rock River Railroad (Rock Falls to Amboy) has been purchased from the proceeds of a new issue of \$720,000 of the company's 7 per cent. bonds. This line, doubtless, will now be extended to a connection with the Chicago & Iowa Railroad.

It will be seen, therefore, that the company is sure of the traffic of an immense system of roads in Illinois and Iowa, which, whatever their own profit or want of it may be, can only increase the traffic and the earnings of the Chicago, Burlington & Quincy.

RAILROADS AND SOCIAL SCIENCE.

It is Ruskin, we believe, who hazards the statement, that there are evidences that the world is growing more unfit each century for human habitation. That the tendency of population to crowd into large towns and cities makes living at least more unwholesome and in some respects more uncomfortable, there is no room to doubt, and those of us whose lot has been cast in the midst of large cities at times indulge in the apprehension that at no very remote period the whole face of the earth may be covered with human habitations. Be that as it may, it is yet quite evident that the tendency of modern civilization each year is to centralize population more and more in large towns and cities. This it is now perhaps folly to oppose. The requirements of modern life, the changed relations of industry wrought by scientific discovery and labor-saving machinery, and the wants—call them artificial, if you choose—of the present day each take away a relatively larger number of people from agricultural pursuits and attract them to either the manufacture or exchange of productions which were almost or quite unknown fifty years ago.

Referring to this subject, the Berlin correspondent of the Nation, in the number of April 23, after commenting on the over-population of that city, makes the following statement:

"The last volume of the 'Transactions of the Social Science Association' (British) contains two or three valuable papers upon the subject of overcrowding; one by Dr. Henry W. Ramsay, especially, embodies the testimony of eminent physicians that the overcrowding of cities, and the overpeopling of dwellings and streets, are in themselves fruitful causes of epidemic disease and of physical and moral degradation. Indeed, men of the highest scientific authority do not hesitate to say that such overcrowding, the aggregation of such masses in small spaces, tends to the physical deterioration of the human race."

"Dr. Schwabe, Director of the City Bureau of Statistics, has prepared a tabular view of the relative density of population to house-accommodation in the five principal cities of Europe. In London, the average number to a house is 8 persons; in Berlin, 32; in Paris, 35; in St. Petersburg, 52; and in Vienna, 55. This comparison is fair, with the exception of London, where the size and style of houses differ essentially from the Continental system of flats. In London, rent absorbs from one-tenth to one-eighth of income; in Berlin, one-fifth to one-fourth; in Paris, over one-fourth; and in Vienna, one-third. The rate of mortality seems to follow an arithmetical progression in analogy with the ratio of tenants; thus, for every 1,000 the yearly deaths are: in London, 24; in Berlin, 25; in St. Petersburg, 41; and in Vienna, 47. The same curious analogy runs through the ratio of illegitimate births; there are in London 4 per cent., in Berlin 16, in Paris 20, in St. Petersburg 26, and in Vienna 51."

"So many causes influence both mortality and illegitimacy—especially the latter—that only the crudest philosophy would generalize from these data an argument for or against a particular mode of house-building, yet the relation of the figures are too striking to be dismissed as accidental. In two ways the overcrowding of cities tends to immorality; first, among the poor, through the huddling together of the sexes in confined apartments; and next, among well-to-do, by making rent so formidable an item in family living, that many seek an easy substitute for marriage, facilities for which are also created by the hotel-and-lodging system which overcrowding favors and necessitates."

If we reflect upon the location of the city of New York, we will see that it is especially liable to these evils. The area of Manhattan Island is only about twenty-two square miles, a great portion of which extent goes into length, the island being about thirteen and a half miles long, and only averages a little more than a mile and a half wide. Quite half, if not more of the whole available area is now built over, chiefly on the southern half, so that with the increase of population the distances are constantly growing greater, and even now it is impracticable for a person whose time is much occupied to do business at one end and live anywhere near the other. The result is that each year population is becoming more and more dense in the lower half of the city. This over-crowding has been attended with most if not all the evils referred to above, to say nothing of others of a political character whose effects upon the welfare of the community, although not so easily estimated, are doubtless much worse in their ultimate effects. Of course good sanitary regulations will do much to ameliorate the condition of those who are thus overcrowded, but the political evils to which we have referred do much to make such sanitary regulations impossible. Education, both mental and moral, also has an immense influence on such a community; but when a population of this kind is degraded, impoverished and diseased, even religion does little to improve its condition, excepting in the way of giving consolation.

It, therefore, each year, becomes a problem of graver import to provide some means of distributing this population, and supplying it with more space, more pure air and better food. The evils, physical, moral and social, can be directly attributed to the density of the population. This once distributed, the evil is greatly mitigated, and a better life is made possible. Those who give much thought to the subject will soon perceive that it is not alone the lower strata of society which suffers, but that all classes are interested, and that it only requires a little careful observation to see that the question has not only social, hygienic and economic aspects, but that the romance of life hangs by gossamer threads to its solution, and that

the happy day for Charles Augustus and Cynthia Jane is often either made impossible or delayed because the rate of speed in the journey, from the City Hall to Westchester or Jersey, is so much slower than the throbbings of their hearts; and wo to them if they are too poor to afford an establishment on any respectable street, and too proud to live in a tenement-house. In fact, it would not require a very vivid imagination to conceive of a splendid denouement to a play, a novel or—real life—if we picture to ourselves Cynthia Jane, trustful yet despondent, waiting for Charles Augustus to gather in the ducats, so as to make it "prudent" for them to marry. Imagine the rich old man entering, to tempt Cynthia with wealth: she doubts, desponds, hesitates; but in the very nick of time Charles enters exuberant, with a new time-table in his hands, which announces that Vanderbilt, Buckhout, Ricker or the new Erie management have reduced the time between the City Hall and some quiet lodge in a remote wilderness, to which the fair Cynthia will now be transported and the two live happily ever after.

Notwithstanding the fact that railroads are proverbially prosaic and matter of fact, it is yet not hard to imagine that the whole social question around which cluster all kinds of considerations of health, life, comfort and happiness may be entirely changed, and the evils to which we have referred avoided and the good made possible, by a more complete system of metropolitan and suburban travel in all our large cities and towns.

That the extent of the inhabitable area of a city is increased as the square of the speed at which it is possible to travel from any one point in it to another, is easily demonstrated. If we suppose that each person has a given time in the morning and evening—say forty minutes—which can be devoted in the journey to and from his home, then, if he must travel the distance on foot at a speed of about three miles per hour, the greatest distance at which he can reside from his business will be two miles, and therefore the total area available for residences will be that of a circle four miles in diameter with an area of 12½ square miles. If horse railroads are introduced which travel at double this speed, then an area of twice the diameter, or 50 square miles, will be available, and with steam railroads at speeds of 20, 30 and 40 miles per hour, the area of population would be 553, 1,256 and 2,281 square miles, respectively. It will be seen, therefore, that the means of travel may be increased very much in advance of any possible increase of population, and it therefore seems probable that the population of large cities in future, instead of growing more dense, will be more distributed than heretofore. In fact, very much such a condition of things now exists in and around both New York and Boston. Chicago is moving in the same direction. Every additional facility for metropolitan and suburban travel which is provided makes a larger area accessible and distributes the population over a greater extent of country, and to that extent obviates the evil of overcrowding. The effect of the Metropolitan Railway in London was to change almost entirely the character of the population of some of the worst districts; and that a similar effect would follow in New York, if some efficient system of rapid transit were put into operation, there is little doubt. While it is true that the tendency of railroads is, to a certain extent, to carry the vices of cities into the country, it is also true that it makes life in the country possible to those who do business in cities. It is, therefore, probable that railroads will ultimately lessen the density of population in large cities, and possibly give to all city life a sort of suburban character. That such an end may be speedily reached, the present hot weather leads us to devoutly wish.

THE WESTERN & SOUTHERN RAILWAY ASSOCIATION, at its late quarterly meeting in Cleveland, was quite thinly attended—over more so than the Atlanta meeting—which is unfortunate for more reasons than one, and not least because a small minority, however well convinced, is naturally and properly slow to adopt any fixed policy as the decision of the Association.

There were reports on six of the twelve subjects on which committees had been appointed. Concerning the total abolition of commissions on tickets, which the Association had declared in favor of, the committee says that it is impracticable to secure this without unanimity in action, recommends that the general ticket agents agree upon a uniform rate to be paid by all lines *pro rata*, and the appointment of a delegate to negotiate with companies not represented in the Association for the abolition of the system after the current calendar year. In the discussion there was but one opinion as to the desirability of abolishing the system; but the general opinion was that it depended almost entirely on the great trunk lines, and chiefly Eastern lines, which may be slow to act. Mr. A. Anderson, of the Toledo, Wabash & Western Railway, was appointed as delegate as recommended by the committee.

The Committee on the Best Means of Bringing about the Total Abolition of the Pass System reported that the united action of all the companies would be necessary for this. The subject was indefinitely postponed.

A report on train dispatching was submitted by Mr. A. A. Talmage, of the Atlantic & Pacific, which elicited considerable discussion. The Secretary was instructed to procure the rules of the different roads, to be submitted to a special committee to analyze and report upon at the next meeting.

The Committee on Wheels and Axles made a general preliminary report, in which it was stated that the methods of manufacture are so various as to make it impossible to say what is the limit of safety in the life of wheels and axles.

On the height of car-bumpers, the recommendation of the Master Car Builders' Association, that the distance be 32 inches from center of draw-bar to top of rail, was endorsed for railroads north of the Ohio; and a standard of 30 inches was recommended for railroads south of the Ohio, where the variations now are said to be from 21 to 42 inches!

A committee was appointed to inquire into the cost of doing postal service for the government, and the basis on which the Post Office Department determines the amount of compensation to the companies.

The next quarterly meeting is to be held in Louisville in October.

RAILROAD ACCIDENTS not unfrequently occur in which, while it is very plain that some one was very much to blame, it is yet very difficult to fasten upon that one. But in the case of the accident at Hubbard's Station on the South Side Railroad of Long Island on the 4th inst., the delinquency—or rather the criminality—seems unmistakable. A train having reached a station nine minutes late, and the rule being that trains of its class should not go ahead upon the single-track section of road in advance until all opposing trains should have arrived or should be 24 minutes late, and there being an opposing train due in eight minutes, the conductor deliberately ordered forward his train, it being at that time by his watch only five minutes before this opposing train should leave the next station! If anything can be more amazing than this, it is the plain, straightforward statement he made of the way in which he deliberately decided to violate the rules and "take the risks," by which he succeeded in killing three people and mangling four or five more. The following is a report of a part of the examination of the delinquent conductor by the Superintendent:

In answer to the Superintendent's question why, knowing that he was behind time in starting, and was not allowed to consume the four minutes allowed for variations, he had gone on, the Conductor said he thought it would take the train from Rockaway the same time to reach Hubbard's as for him to go there, and then he would have four minutes to spare. "Do you not know that you had no right to use the four minutes?" asked the Superintendent. He replied: "I had no right to use the four minutes, but I knew Lynch would stop for me. I left Bushwick at twelve minutes past five. I had no right of way, but I thought I could make it."

Superintendent—Is it usual to run trains in the four minutes allowed for variations of watches?

Conductor—It is not; but we did use it.

Superintendent—You understood from the rules it was not to be used?

Conductor—I thought I could run it in.

Though this accident was caused by knowingly violating the rules of the road, and there can be no excuse for the responsible train officers who were guilty, yet we cannot say that the company is blameless. A proper use of the telegraph would have made this accident almost impossible, because it would have taken the control of the train away from the conductor as soon as his train was behind time and given it to an officer who would have known the positions of both it and the opposing train. The east-bound train having arrived at Bushwick nine minutes behind time, the train dispatcher would either have held it there until the west-bound train had passed it, or, more probably (as thus time would have been saved,) he would have held the west-bound train at Hubbard's and sent forward the east-bound train to meet it there—just as its engineer intended to do, tried to do, and just failed of doing for the want of the knowledge and power which the train dispatcher, under a proper system of moving trains by telegraph, always has.

CHICAGO AND DUBUQUE will now be connected by a new route—the Chicago, Burlington & Quincy from Chicago to Aurora, the Chicago & Iowa from Aurora to Forreston, and the Illinois Central from Forreston to Dubuque—on which trains will run through, the injunction obtained by the Chicago & Northwestern having been dissolved. The distance by this route is 201 miles, while by the Galena Division of the Northwestern and the Illinois Central it is 188 miles. Probably all the railroads from Dubuque westward will make this new route their eastern outlet; and the Illinois Central has 400 miles in Iowa whose traffic will go this way. The freight, however, has taken this route some time, the injunction only prohibiting the running of Illinois Central passenger cars through over the route.

We understand that the Illinois Central will dispatch a passenger daily through from Chicago to Sioux City, 528 miles, by this route.

The turning of the Illinois Central traffic (from 480 miles of road) over this route gives a large business at once over the entire length of the new Chicago & Iowa road, the freight from the north which formerly passed over the Chicago, Burlington & Quincy from Mendota to Chicago now taking this line, with a saving in distance of 15 miles from all points north and west of Forreston.

THE MEXICAN RAILWAY COMPANY, which held its annual meeting in London recently, has not had so favorable an experience with its railroad as to be very encouraging to those who have schemes for new lines in that country. It has two sections of a line from Vera Cruz to the city of Mexico completed, one from Vera Cruz to Fortin, 70½ miles, and one from Mexico to Puebla, 116 miles. The capital account at this time is at the rate of \$118,000 per mile; the gross receipts of the Vera Cruz section about \$4,500 per mile; on the Puebla section, about \$6,000 per mile. The proportion of working expenses to receipts was 86½ per cent. on the Vera Cruz section, and 51 per cent. on the

Puebla section. On the whole the net receipts were about \$2,045 per mile, which does not pay a very good interest on \$118,000. The company is now constructing an extension from Vera Cruz to Apixaco, 106 miles, in which are two of the most difficult railroad works ever undertaken in the world, the crossing of a tremendous ravine, and a rise of 3,000 feet to the summit of the Maltrata Pass in a distance of 18½ miles. The latter, of course, will be very costly to work as well as to construct.

During the first three months of 1872 there was a considerable decrease in the receipts of the upper or Puebla section, owing to "disturbances," which same disturbances, by the way, are so nearly chronic in that unfortunate country that there is comparatively little traffic for the railroads, and that is liable to interruption, and the works of the roads to destruction, much of the time. This it is that makes very improbable—we might say almost impossible—any such development of traffic by railroads in Mexico as there has been in this country. It matters little how easily you can get your productions to market, if you are liable every few months to have a troop of soldiers or banditti ravaging your plantation, burning your house, stealing all your movable property, and, perhaps, making a target of yourself.

By the way, we see that considerably more than half of the tonnage of the upper section of this railroad was in *pulque*, the Mexican whisky.

RUSSIA has a railroad system small in comparison to its extent of territory or even its population, but growing rapidly, and apparently already in excess of the demands of traffic, if the earnings be taken as an indication. The first railroad in the empire—that from St. Petersburg to Moscow, 400 miles long—was opened in 1851. In 1866 there were only 2,065 miles, and at the close of 1871, 8,477 miles. It is expected that about 1,300 miles more will be completed in 1872. Most of these lines, we believe, have been aided by the Government, either by grants of aid for construction, or by guaranteeing a certain minimum dividend on the shares, which made the latter readily negotiable, whether the lines were promising or the reverse. So far the Government has been called on largely to pay guarantees, for 1870 the amount advanced by it being \$4,680,255, out of \$15,927,060 which it had guaranteed—29 per cent. We may believe, therefore, that nearly one-third of the capital invested in Russian railroads earns no income from traffic. The curse of the system (as of many others) seems to be its excessive capital account, which is at the rate of nearly \$100,000 per mile for the whole system, and this in a country where land is cheap, towns few, wages low, and where English iron ought to be cheaper than in America, while the roads themselves, we understand, are by no means superior either in construction or equipment. One is tempted to think that when satisfactory guarantees of interest are made, the managers of a line are likely to make its capital account as large as possible, to say nothing of contractors who have an eye to the main chance, and like Russian money quite as well as any. The gross earnings are not so bad—about \$7,000 per mile—and the operating expenses are about the same as ours—about 60 per cent. This leaves \$3,800 per mile net, which will pay a very pretty dividend on the absolute cost of most well-constructed and equipped railroads in this country.

General Railroad News.

CHICAGO RAILROAD NEWS.

Illinois Central.

This company has established its general offices in the reconstructed land building, No. 58 Michigan avenue. The building is 30 feet wide by 140 in length, and four stories high, and furnishes commodious rooms for all the general offices. It is finished off throughout inside with pine, the walls and ceilings being paneled with this wood, the panels being bounded with black walnut.

The first floor is occupied by the Treasurer, the Land Department, and the General Freight Agent. The second floor is occupied by the Auditor, the Train Master, the Telegraph Department, and the General Superintendent. The third floor is occupied by the President and General Passenger Department. The fourth story is devoted to the uses of the Purchasing Agent and the Engineering Department. The building is furnished with an elevator to carry telegrams to the telegraph office, and with tubes so as to make oral communication with the several offices very easy.

Illinois Central.

The company is ballasting its road with broken stone, there being scarcely any gravel on the line. The track is now ballasted from Chicago to Arcola, 158 miles.

Chicago, Burlington & Quincy.

The injunction restraining the Chicago, Burlington & Quincy Company from using the Northwestern bridge at Clinton has been made permanent, so that the Chicago, Burlington & Quincy Company will be obliged to go ahead and build their own bridge at that point. The stock is all subscribed, and the bridge will be built as soon as possible.

Right of Way.

The Chicago, Danville & Vincennes and the Pittsburgh, Cincinnati & St. Louis Railway companies have about completed the purchase of land in the city sufficient to give them the right of way into the city, and for passenger and freight depots. It is estimated that the three companies, the Chicago, Danville & Vincennes, the Milwaukee & St. Paul, and the Pittsburgh, Cincinnati & St. Louis companies, have paid about \$2,000,000 for the land so purchased. Between Halsted and Ada streets, the two latter roads have purchased the entire tier of lots fronting north on Kinzie street, the Pittsburgh, Cincinnati & St. Louis taking the north half of the lots, and the Milwaukee & St. Paul the south half. These companies are building a ten-foot wall at

the southern limit of the ground given them by the city on Depot place. From Reuben street west to Leavitt street the Pittsburgh, Cincinnati & St. Louis and the Milwaukee & St. Paul companies have purchased the lots fronting north on Kinzie street, and from Leavitt street to Western avenue the Chicago, Danville & Vincennes and the Pittsburgh, Cincinnati & St. Louis companies have joined in the purchase, the latter owning 75 feet and the former 50.

New Engine House.

At the corner of Western avenue and Seymour street the Pittsburgh, Cincinnati & St. Louis company have bought an entire block in Adams' Addition and another block in Cossitt's Addition, a portion of which will be used as the site of a round-house for the company.

Chicago, Danville & Vincennes.

This company has purchased land three blocks east of Halsted street, between Carroll and Wayman, on which they will shortly commence the erection of a freight house.

Chicago & Alton.

The company is having the Goodale steam brake fitted to a passenger train for trial. It has also been trying a new spark arrester, which is said to collect ten or twelve bushels of fire cinders in a run of 125 miles, which are easily removable.

Chicago, Rock Island & Pacific.

Six light engines running on the Iowa Division have recently been replaced by six heavy ones, 16x22 inch cylinders, and 54 feet drivers, from the Grant Locomotive Works.

TRAFFIC AND EARNINGS.

The following are the earnings of the Union Pacific Railroad Company during the month of May, as corrected and officially reported:

	1871.	1872.	Increase.
Earnings.....	\$721,466 01	\$890,442 07	\$168,976 06
Expenses.....	345,349 84	470,715 11	125,365 27

Net earnings..... \$376,116 17 \$419,726 96 \$43,610 79
The increase in gross receipts is 23 per cent., in expenses 36 per cent., and in net earnings 11 per cent.

The estimated earnings of the Erie Railway for the second week of July were: 1872, \$396,611; 1871, \$463,097; decrease, \$66,486, or 14½ per cent. The increase since April 1 is \$483,976, or about 9½ per cent.

The earnings of the St. Louis & Southeastern Railway for the month of April were: \$38,589.89; May, \$38,625.28; for the five months ending with May, \$193,074.23.

The earnings of the European & North American Railroad for June were \$36,961.03. The number of passengers carried during the month was 20,062.

The earnings of the St. Louis & Iron Mountain Railroad for the first week in July were: 1872, \$42,330.00; 1871, \$27,311.58; increase, \$15,018.42, or 55 per cent.; from January 1, to July 8, there were: 1872, \$1,101,463.16; 1871, \$782,581.44; increase, \$318,881.72, or 40½ per cent.

The earnings of the Erie Railway for the second week in July were: 1872, \$416,611; 1871, \$463,097; decrease, \$46,486, or 10 per cent.

The earnings of the Kansas Pacific Railway for the first week in July were: passenger, \$30,174.95; freight, \$37,566.47; mails, \$1,400; total, \$69,141.42. Of this, \$492.07 was received for transportation of troops and government freight.

The following is a comparative statement of tolls received and amounts of the principal articles transported on the Illinois & Michigan Canal for the month of June, 1872 and 1871: Tolls received, June, 1871, \$21,199.65; tolls, including lockage at Henry, June, 1872, \$26,900.17; amount received for lockage at Henry, \$1,608.58. Bushels of corn cleared June, 1871, 687,840; 1872, 1,092,323. Oats cleared, June, 1871, 55,443 bushels; 1872, 132,160 bushels. Lumber, all kinds, cleared June, 1871, 5,377,171 feet; 1872, 5,984,945 feet. Cubic yards of stone, all kinds, cleared June, 1871, 30,303; 1872, 30,473. The canal was closed during the last five days of June, 1871, for the purpose of removing the locks on the "Summit Level."

The receipts of the St. Louis, Kansas City & Northern Railway for the third week of July were: 1872, \$54,418; 1871, \$42,826; increase, \$11,592, or 27 per cent.

The earnings of the St. Louis & Iron Mountain Railroad for the second week in July were: 1872, \$48,022; 1871, \$27,597; increase, \$20,425, or 74 per cent.

OLD AND NEW ROADS.

Erie Railway.

The company announce that, by advice of counsel, it will not recognize as legal \$295,000 of scrip delivered to preferred stockholders in 1869 as a dividend. The dividend is declared illegal because the money represented by the scrip had not been earned.

The company has also brought suit for an injunction to restrain the Jefferson Railroad Company, Jay Gould and Justin D. White from parting with certain stock. The complaint sets forth that while President of the Erie Railway Mr. Gould substantially controlled the Jefferson Railroad, and that he effected a lease of the latter road at twenty-five per cent. of the gross earnings. In carrying out this and other agreements, it is charged that Mr. Gould secured to himself forty thousand shares of \$50 each of the Jefferson Railroad, of which 39,965 are held by Justin D. White in trust for him, and five shares have been given to each of seven men to empower them to sit in the board of directors.

The stock is claimed by the Erie Railway. The complaint further charges that Mr. Gould withdrew from the Erie Railway \$184,000 of the bonds of the Jefferson Railroad, substituting an equal amount of doubtful bonds, and also \$311,000 of the bonds without any return whatever.

The company has decided to remove its offices from the magnificent apartments in the Grand Opera House, corner of Eighth avenue and Twenty-third street, which they hold at a rental of \$55,000 per year on a lease from Jay Gould and the heirs of James Fisk, Jr. The company claims that the lease is illegal, because Gould could not, as an officer of a company, make a contract with himself as an individual on terms determined by himself. The company intends to refit its old offices on the block bounded by West, Reade, Washington and Duane streets (down town), which has remained in its possession.

At the first meeting of the nine directors, the following resolution was adopted:

Resolved, That in all cases where bonds or undertakings on behalf of this company are necessary to be given in legal proceedings, or otherwise, that the Treasurer of the company, for the time being, be and he is hereby authorized, under the authority of the Executive Committee, to use any of the securities or moneys of the company to the extent necessary for such purposes as indemnity and security for the execution of any such bonds or undertaking by the sureties, and that any securities thus used be reported to this board.

It is reported that another meeting has been held to fill the vacant offices of Treasurer and General Superintendent. Mr. James B. Hodgskin, of the banking house of Hodgskin, Randall & Hobson, New York, is said to have been chosen Treasurer. He is Treasurer of the Atlantic & Great Western Company. No appointment of Superintendent is announced.

Oregon & California.

The following interesting and important statement of the present condition of this company we copy from the *Kalama* (Washington Territory) *Beacon* of June 21:

"In the suit now pending in the courts, wherein Elliott sues the President (Ben Holladay) for ten millions of dollars, Mr. Holladay was two or three weeks giving testimony in San Francisco at the instance of plaintiff, in which he ventilated his railroad affairs further than he voluntarily made public in the business details of corporate management.

"In his testimony before the commission, Mr. Holladay stated that the bonds for building what is known as the East Side Railroad (Oregon & California Railroad) were issued to the extent of \$56,000 per mile, to the amount of nearly \$11,000,000, bearing interest at 7 per cent., which were negotiated at 64, and brokerage and commissions off, netted 58. This would realize something less than \$6,500,000, which fund was a cash basis to build a railroad south from Portland up the Wallamet valley on the east side, and continue in the same direction toward the California State line through Umpqua and Rogue River valleys. Mr. Holladay contracted with the Oregon & California Company to construct their road at \$30,000 in coin per mile to the extent of the bonds sold; it will be seen at a glance that would only build about, or slightly more than, 200 miles—which is the distance from Portland to Roseburg, in Douglas County, 95 miles north of Jacksonville, and not two-thirds of the distance to the State boundary on the south.

"By recent news from Roseburg, it appears that Mr. Holladay has completed the road to that point, which exhausts the railroad fund, according to the statement of Mr. Holladay in the Elliott case. What gives a color to the fact of the road being brought to a cessation in Umpqua valley is, that labor has ceased on the line, and it is reported the contractor is about to remove all his force from Umpqua to his contract on the Northern Pacific road in this Territory near Olympia.

"The road from Roseburg to the California line will be of quite another character from the light road-bed up the Wallamet and easy grade to Roseburg. The cuts and fills to reach Rogue River valley to Jacksonville, as well as the mountains to the southern boundary, will require a great deal more cash and engineering than had to be expended per mile so far as constructed.

"The foregoing does not close the dilemma of the two Oregon railroads, because the following question is to be answered and provided for, viz.: Where is the fund to pay the interest on the bonds which are sold, annually amounting to more than three-fourths of a million dollars? The road is scarcely paying running expenses, and no interest fund can be created from that source. The land subsidy is said to be no security for the bonds, their guarantee being confined to road-bed, franchises, etc., and the land subsidy is already passed into the hands of an immigration company, in which there is no bondholders' lien.

"We are gratified to be informed that in any eventful cloud upon Oregon railroad affairs, their enterprising founder will not be an individual sufferer to any great degree. He has built above two hundred miles of road southward along very light grades to where the funds terminated at Roseburg, and he is said to have cleared at least fifty per cent. on his contract."

Kansas Central.

This narrow-gauge road is now completed 45 miles from Leavenworth. The grading is finished 11 miles further.

Baltimore & Potomac.

The *Baltimore Gazette* thus describes the line: "Leaving Washington the road passes through the Navy Yard Tunnel, 1,600 feet long, and crosses the eastern branch of the Potomac by a bridge 1,600 feet long of strong trestle work, in the centre of which is a 100 foot Howe truss span, erected by the Kingston Bridge Company. Next comes a 75 foot Howe bridge over Beaver Dam, six miles further on, and a trestle mile further north Watt's Branch requires a 50 foot bridge. Two miles north of Huntington, now called by the railroaders "Bowie," in honor of the President of the company, the ex-Governor of Maryland, is the Big Patuxent. Over this there are two spans of the Howe truss works, each 150 feet in length.

"About two miles further on is the Howe truss span of 180 feet over the Little Patuxent, and less than a mile beyond is the bridge over Rogue's Harbor Branch, a 55-foot Howe truss. Over the few streams of water between the Annapolis road and the Patapsco there are stone culverts. Over the Patapsco there is a fine bridge, built on

three firm granite piers on pile foundations. The bridge is in four spans, and 500 feet long. The road passes under the Baltimore & Ohio Railroad a few miles north of the Relay House by a tunnel, and over Gwynn's Falls by a bridge 500 feet in length and 80 feet in height. Over Gwynn's Falls Branch there is a 75-foot truss bridge. The length of the road is about 37 miles. There will be nineteen stopping places between the two cities to accommodate the people along the road. The telegraph wires are up from the office on Virginia avenue, Washington, to Baltimore.

"The equipment is first class in every respect, the rolling stock consisting of 21 engines, built at Philadelphia, 33 passenger coaches, 200 freight cars, 108 box cars, 100 flat cars, and 8 baggage cars. The passenger coaches are models of comfort, elegance and durability.

"The fare between Baltimore and Washington has been fixed at one dollar each way. Six trains will run daily from each city, as follows: Leave Baltimore at 3:20, 6:35 and 8 a. m., and 2:05, 5:05, and 7:20 p. m. Arrive at 6:45 and 10:35 a. m., 12:10, 5:35, 6:45, and 9 p. m.

Chicago & Northwestern.

The *Milwaukee News* says:

"The facts about the Lodi road and about the Fond du Lac Air Line (so called) are as follows: The Chicago & Northwestern Railroad Company has executed a contract with the Northwestern Union Railroad Company to build both the Fond du Lac line and the Lodi line when \$500,000 of local aid shall be secured, and this contract has not been in any way modified, amended or changed. But the Chicago & Northwestern Company has concluded to proceed immediately with the construction of the Fond du Lac line, on the strength of the fact that something like \$200,000 of aid has been secured for that. They will push the work and complete the road as quickly as possible. The road will run to West Bend, thence to Mayville, and thence to Oakfield, on the Chicago & Northwestern Railroad. The Lodi road is under contract to be built when the terms of the contract are complied with."

Georgia Railroad Bonds.

The Committee of the Georgia Legislature appointed to investigate the issues and guarantees of bonds by the State during the administration of Gov. Bullock make the following recommendations:

1. The Report shows that the Governor endorsed \$104,000 Alabama & Chattanooga Railroad bonds, and that the only informality in these bonds was a failure to attach the seal of the State. The Committee recommend that these bonds be recognized as valid.

2. The State's endorsement upon \$240,000 bonds of the Bainbridge, Cuthbert & Columbus Railroad, to be declared null and void, because the bonds were issued before sufficient road had been completed, and because they were devoid of the State seal and without signature of the Secretary of State.

3. The State's endorsement of \$270,000 bonds, issued by the Cartersville & Van Wert Railroad, and of \$300,000 bonds of the Cherokee Railroad, to be declared null and void, chiefly because the bonds were issued upon the completion of three miles of road instead of five.

4. All the outstanding currency bonds to be declared null and void, the amount of which we believe not to be large, those obligations having been, to a considerable extent, satisfied through the substitution of the "gold bonds" of the State.

5. The State's endorsement of the Macon & Brunswick Railroad to be declared legal.

6. Of the \$2,290,000 quarterly gold bonds sold and hypothecated, those issued for the purchase of property or sold by Bullock and his agents to be recognized as good; those on which money was borrowed by the State agent to be returned, and the money, interest and expenses paid with new currency bonds or cash; and the \$100,000 in H. Clews & Co.'s hands not to be paid.

7. The State's endorsement of \$3,300,000 of bonds of the Brunswick & Albany Railroad, and its issue of \$1,800,000 bonds direct to that road, to be respectively declared null and void; mainly because the former were issued in advance of the completion of the twenty miles sections of road, and because the latter were issued, though under the authorization of the Legislature, "in defiance of the Constitution."

8. The committee report the South Georgia & Florida Railroad endorsed bonds legal; and also the State road mortgage bonds issued by Gov. Jenkins and used by Bullock.

Bayfield & St. Croix.

The famous St. Croix land grant, which has been before Congress so long, was before the United States Circuit Court at St. Paul, recently, in a case arising out of claims for timber cut on the land, and a decision was made which is thus reported:

"The Court, consisting of Judge Miller, Associate Justice of the Supreme Court, and Judge Dillon, Circuit Judge, delivering its decision by Judge Miller, decided: first, that by the act of 1856 the title in these lands had vested in the State of Wisconsin, in trust; that the power of the State was limited by that act; that the State could not vest the title to the lands in any company until the terms of that act were complied with, i. e., the railroad built, and therefore that, as between the State and the companies chartered by it, the title was in the State; and second, that the title having been vested by the act of 1854 in the State of Wisconsin, it could not be resumed by the United States, save by act of Congress, and possibly by judicial decision only, and that in consequence the title to the lands in question remained in the State of Wisconsin, although the railroad had not been constructed, and would so remain until divested in one of the manners named."

This decision, it is said, prevents the Commissioner of the Land Office and the Secretary of the Interior from returning these lands to market, and will enable the State, through a chartered company, to build a railroad connecting the St. Croix with Superior City and Bayfield, unless Congress can at its next session be induced to revoke its grant already made.

Peoria & Rock Island.

In the case of Esquire W. W. Warner of the Western Township, Henry County, who sued this company for trespassing on his land for their roadway, the Supreme Court of Illinois has decided that the proceedings of the company in their condemnation of the right of way through the county were unconstitutional, and that every person, whose land was crossed or injured by the railroad, can recover the value of the land taken, unless he has already settled with the company. This was a test case, and there is a number of suits in the Henry County court awaiting this decision.

Northeastern of Georgia.

The Augusta *Chronicle and Sentinel* says that the Chief Engineer of the Northeastern Railroad invites proposals for grading the road bed from Athens to the point of intersection with the Air Line Railroad, a distance of 38½ miles. The report of the survey made by the Engineer, as made to the board of directors, has been published. The estimate of the cost of the 38 miles is as follows:

Grading, masonry and bridging.....	\$205,303 88
Iron, nails and fastenings.....	233,088 00
Cross ties and track laying.....	38,580 00
Limited equipments and depots.....	75,080 00
Ten per cent. to the above for engineering and contingencies.....	56,505 18
Total cost.....	\$621,556 98
Cost per mile.....	16,102 51
Cost per mile of grading.....	5,422 28

Indiana & Illinois Central.

The Indianapolis *News* says of this road: "The stories put in circulation by the enemies of the road, to the effect that it would be diverted at Montezuma from the route direct to Indianapolis and connected with the St. Louis or the Terre Haute are entirely without foundation. The parties who have now undertaken to build it have obligated themselves to build the whole road from Indianapolis to Decatur. They mean to do it. The construction was commenced about the 1st of April. The iron is now down on thirty miles through Douglas County, Illinois, and the bonds donated by that county were executed and delivered to Mr. Hammond, the President, on Saturday. The work is now progressing eastwardly from that point, and will certainly be finished to the Wabash this fall."

St. Louis & Iron Mountain.

This company announces a dividend of 15 per cent. payable in full-paid shares of the Cairo, Arkansas & Texas Railroad Company (late Cairo & Fulton of Arkansas). The certificates for the shares will be delivered on and after August 15 to holders registered July 2, at the office of H. G. Marquand, the Vice-President, No. 120 Broadway.

Toledo, Ann Arbor & Northern.

This company has called for the payment of the last installment of 50 per cent. due on the stock. In the call he speaks of the progress of the road as being satisfactory. Thirty miles of the road bed are completed, contracts for building the bridges and culverts have been let, and two of the three large and seven of the small pile bridges are completed. Timber for the culverts is bought and paid for, and contracts for the cattle guards are let. Over 33 miles of right of way is secured and liberal arrangements made as to land for stations, round-houses, &c. Arrangements have been made with the city of Toledo, by which the Ohio end of the road will be built. The road bed is being constructed with the proceeds of stock subscriptions, no bonds having been issued.

Wellington, Gray & Bruce.

A section of this railroad from Clifford to Paisley, Ont., 30 miles, was opened July 8. About 15 miles more will complete the main line to its terminus at Southampton on Lake Huron, which is about 80 miles further north than Saginaw, Mich. The company has made arrangements for the construction of the Southern Extension, which will diverge nearly at right angles from the main line at Palmerston, 42½ miles from Guelph, extend southwest about 20 miles, then make a right angle and extend on a line nearly parallel with the main line and about 20 miles distant from it northwest to Lake Huron at Kincardine, 25 miles southwest of Southampton. The length of this Southern Extension will be 67 miles. The municipalities along the line have voted it bonuses amounting to nearly \$14,000 per mile. It is hoped to have this line completed by the end of this year.

Brazil Coal Traffic.

So much is said of the traffic which the block coal mines of Brazil, Ind., and vicinity will supply to various railroads that the following statement of the amount now being raised and shipped daily, given in a letter to *The Coal and Iron Record* dated July 10, will be interesting: Fourteen companies ship from 5 to 23 car-loads each daily, making an aggregate of 157 car-loads. Freight per ton (of 2,000 pounds) are: To Chicago, \$2.25; to St. Louis, \$1.85; to Louisville, \$3; to Indianapolis, \$1; to Terre Haute, 50 cents. The price on board at Brazil is \$2.50 per ton.

Hoosac Tunnel.

The east heading of the west shaft advanced 142 feet last month in 25 days, the best progress made since its commencement.

Connecticut Western.

At a special town meeting at Hartford, July 15, George W. Moore was chosen agent of the town to vote upon its stock in this company. The meeting refused to instruct him to oppose the amendment of the charter permitting the construction of a branch from New Britain to Collinsville. This action of the town is believed to insure the building of the road, as the amendment has passed the Legislature, and only needs to be approved by the stockholders. The receipts of the road since the opening, last winter, were \$149,000, and the running expenses \$46,000. The road now owns 7 locomotives, 10 passenger and 175 freight cars.

Grand Trunk.

At the Belleville Inquest Mr. C. J. Brydges, the General Manager, was examined, when he made the following

statement concerning the progress made in the replacing and improvement of the permanent way: "Between Montreal and Toronto the whole line of rails has been relaid within the last five years. In 1867 there were 61½ miles laid; in 1868, 61½ miles; in 1869, 60½ miles; in 1870, 68 miles, of which 32½ were steel, and in 1871, 87½ miles, of which 41 were steel. That made a total in 5 years of 339 miles, or 6 miles more than from Montreal to Toronto. As regards ties, the original number laid between Montreal and Toronto were 707,500. In the five years from 1862 to 1866 inclusive, 750,000 ties were put into the track, and in the years from 1867 to 1871, both inclusive, there were put in 600,790, so that the whole of the ties between Montreal and Toronto have been renewed twice in ten years. There is always more or less ballasting being done. During the last three years we have ballasted upwards of 150 miles between Montreal and Toronto. We are this year putting in about 150,000 ties and 80 miles of steel rails, and we shall ballast this year 80 miles of track. In two years from this the whole line between Montreal and Toronto will be laid with steel rails."

Mount Lookout & Cincinnati.

This is the name of the new Cincinnati narrow-gauge railroad, which is not a street railroad precisely, but a suburban road, connecting with a street railroad, but itself operated by steam dummy engines and running up the crooked Crawfish Creek to Mount Lookout, where the Cincinnati observatory is to be, and which is intended to be made into a suburban town, with a branch to the village of Oakley (not yet completed).

Iowa Pacific.

A. Spalding, of Cedar Rapids, Iowa, has the contract for the bridging and piling on 100 miles of this road.

Galena & Southern Wisconsin.

A considerable force of men is at work on the grading of ten miles of this narrow-gauge road—from Galena north to the Wisconsin line.

Detroit Tunnel.

The drainage tunnel, five feet in diameter, is now advanced from the shaft a distance of 900 feet. The material through which excavations have been made so far is blue clay mixed with a little sand. Numerous springs are encountered, some of sulphur water; but no obstacle to the construction is apparent, though the work will probably be more disagreeable than in the Chicago lake tunnel. It is intended to have this drainage tunnel constructed by December.

Holland & Sangatuck.

A railroad between these two Michigan towns is talked of. The distance is about 12 miles.

Jackson, Lansing & Saginaw.

The track on the northern extension is laid four miles above Spring Vale at the crossing of the Tawas & Manistee State road. Grading is in progress and laid out for 60 miles further.

Port Huron & Lake Michigan.

The report that track-laying was about to begin on this road eastward from Owosso, is contradicted. It is not probable that anything will be done between Owosso and Flint the present season, as the necessary local aid is not forthcoming.

Flint River.

The iron is laid on this road to Geneseville, four miles from the junction, and the track-layers are pushing ahead.

Grand Rapids & Indiana.

Gov. Baldwin has just inspected and accepted the fifth division or a section of 20 miles of this road, from Leroy to a point about three miles north of Chalmers Lake. He is also to inspect the line of the road from Grand Rapids south to the State line, about 86 miles.

Cairo & Vincennes.

This road has been completed from Carmi to Grayville, Ill., about 16 miles.

Wells & Southeastern.

Articles of incorporation of this company have been filed with the Secretary of State. The company propose to build a road from Wells, Minn., to a point on the south line of the State, in Faribault or Freeborn County. The capital stock is to be \$1,500,000.

Houston & Great Northern.

The Texas *State Journal* says that the Supreme Court has decided the land case in favor of the company, and the State government will now be obliged to issue the land certificates to the company.

The Clarksville (Texas) *Standard* says that it is yet uncertain whether the road will go to Clarksville or to Sulphur Springs.

Green Bay & Lake Pepin.

It is announced that this road will be extended this year a distance of 110 miles west of New London, making its length from Green Bay 150 miles. Its western terminus will be then within 50 miles of the Mississippi River.

Sioux City & St. Paul.

It is reported that only about 30 miles of track remain to be put down to complete this road to its junction with the Dubuque & Sioux City line at Lemars, which is 23 miles northeast of Sioux City. Then Sioux City will be only 433 miles from Duluth—nearer by 96 miles than to Chicago, and there will be, probably, only one change of cars on the route.

Grand Rapids, Rockford & Greenville.

The Detroit *Tribune* says that this road is to be consolidated with the Grand Rapids, Greenville & Alpena, and bonds to the amount of \$16,000 per mile issued for the whole length of the road; that the whole line will be about 200 miles in length, and that work will be begun at once. Gen. George W. Cass, of Pittsburgh, Pa., and Winslow, Lanier & Co., of New York, are said to be aiding the company, whose road will be virtually a branch of the Grand Rapids & Indiana.

Central Pacific.

The track of the Visalia Division is now laid a mile and a half south of the Tule River, over which a bridge is completed. The main force is now at work at Goshen, the name of the Visalia Station, where a round-house and other improvements are being constructed. The work of extending the road south to Bakersfield will be more vigorously prosecuted as soon as the hot weather is over.

Mansfield & Grand Haven.

A railroad is proposed from Mansfield, Ohio, to Quincy and Grand Haven, Mich. It is reported that the Baltimore & Ohio Company have offered to iron, stock and operate the road, if the road-bed is graded.

Railroad in Japan.

A correspondent of the New York *Herald*, writing from Yokohama, June 2, says:

"That immense elephant—the railroad—which the Japanese have had on their hands for the last three years, has at length shown some signs of life. After a period of nearly three years since ground was first broken, the line has been opened for a distance of 13 miles. Why it was not opened before for this distance it is difficult to say, unless a reason can be found in the fact that those who had charge of its construction were heartily ashamed of the results of their labors. As before stated, this paltry line—the whole length from Yokohama to Jeddo is only 17½ miles—has been nearly three years in construction. It runs through a country entirely devoid of physical difficulties; labor is plentiful and cheap; money and men have always been on hand. It is a single-track road—3 ft. 6 in. gauge—and the only perceptible result of all this is a line in working order of 13 miles in length, and it has cost very nearly \$120,000 per mile. Where the money has gone to it is hard to say, but there are the figures. The road was opened to the public on the 13th inst. There are first, second and third-class cars. The two first mentioned cars are something like our street cars, only they are narrower and in every way smaller. The first-class cars are divided into three compartments by sliding doors, and carry twelve persons comfortably. The second-class cars differ from the first only inasmuch as they are not subdivided, and are furnished with cane seats instead of leather ones. The third-class cars look like diminutive cattle cars, with wooden benches in them. A train in motion looks very much like a huge and clumsy toy. Still it is not nearly as bad a road as it was expected it would be. Although one gets a considerable shaking in the thirty-eight minutes' ride, the cars run much smoother than I ever dared to hope they would. There is an immense number of officials attached to each train—each car will average two—for what purpose I cannot say, unless it be to display the brass buttons worn by each of them. They run at a speed of about twenty-two miles an hour. Since the road has been opened it has done quite an amount of business, its receipts averaging about five hundred dollars per day. The tariff is ridiculously high: First class, \$1.50; second class, \$1; third class, fifty cents. I have been told that these rates will be reduced very considerably on the 1st of next month. As to the time when the line will be opened all the way to Jeddo I am loth to venture a prophecy; but, judging from the past, I should be inclined to suggest about the early part of 1874. If Japan has to pay for all her contemplated railroads in the same ratio as she has paid for this I am very much afraid that some time will elapse before any distant points are connected in this manner."

Montclair Railway.

The long cut through the hill, east of the Passaic River, and opposite Belleville, N. J., which is the chief obstacle to the completion of this road, is progressing as rapidly as possible. This cut is over a mile long, and varies from 20 feet to about 90 feet in depth. The three steam excavators which have been employed on the earth work have now completed their part of the work, and the cutting is now being made through sandstone. Five steam engines are at work, drilling, hoisting, &c., besides a large steam-pump for raising water, and three locomotives are running on the temporary track (3 feet gauge) laid down by the contractors. This work was begun in May, 1870, and it is expected that it will be completed next fall. The road across the meadows, including the bridge over the Hackensack River, will be completed as soon as the cut is finished. The present intention is to run on the south side of Snake Hill and, crossing the Bonton Branch and the Erie road, form a junction with the New Jersey Midland about a mile above the spot where that road now crosses the Erie. The contractors are Messrs. Thomas P. Simpson & Co., of New York.

Newark & Hudson.

The first track is now completed, and work is progressing rapidly on the second track. Construction trains now run through, but it is understood that regular trains will not begin to run until the double track is ready.

Central Pacific.

The Yreka *Journal* says that the laborers now employed on the California & Oregon Branch are being transferred to the Visalia Division, and that the road will not be built any farther north than Redding for the next three years. As soon as the track is laid to Redding, all the hands still remaining will be transferred to the Southern road.

Northern Pacific.

Regular trains have commenced to run on the line in Washington Territory from Kalama to Wethin, four miles from Pumphrey's. A large force is at work between Pumphrey's and Olympia.

Texas & Pacific.

The surveying party on the western end of the road commenced work at San Diego, California, June 27.

Virginia & Truckee.

The first regular train from Reno, on the Central Pacific, to Washoe, was run July 3. Surveys are to be made for the extension from Carson south to Genoa, about 12 miles.

Levis & Kennebec.

A report was presented at the annual meeting of this Canadian company, held July 1, which states that the work of grading was commenced in June, 1871, and was continued by the contractor, Mr. Hulbert, aided by several hundred men. The change from wooden to iron rails, as originally projected, necessitated an increase of capital to \$3,000,000. The line is regarded as a continuation of the North Shore Line, and a link in the Canada Pacific Railway. The Engineer states that the line has been graded 30 miles ready for the ties.

Oregon & California.

Passenger trains commenced running to Oakland, July 3. Oakland is about 55 miles south of Eugene. Construction trains have been running to Estes, 40 miles from Eugene, for some time.

Columbus, McArthur & Gallipolis.

The report of the letting of contracts for the part of this road between Gallipolis and McArthur seems to be erroneous. One of the officers recently reported that the line is located only from Gallipolis north eight miles to the summit. The estimates for grading and masonry to Logansport are \$480,000, and the company has *bona fide* subscriptions of about \$160,000. An effort is now being made to secure subscriptions from the towns on the line, in accordance with the new Ohio law; and if this is done there will be little difficulty in constructing the road. W. H. Langley, of Gallipolis, Ohio, is President.

Boston, Barre & Gardner.

A special meeting of the stockholders was held at Worcester, July 15, to consider the question of extending the road from Gardner to Winchendon, about 7 miles. Colonel Phillips, President of the road, reported that the Vermont & Massachusetts road wanted \$6,000 for permission to pass over their road in getting to Winchendon, in-lsted that all business done by the Worcester & Gardner road on the Vermont & Massachusetts road's line should be considered as the latter's exclusive business, and further, that on no terms would the Vermont & Massachusetts road agree to let them pass over their road for more than five years. The report stated that the Ware River Railroad is in no condition to make any agreement with, and nothing seemed to be left but to build the ten miles of road from Gardner to Winchendon, the right to do so having already been granted by the Legislature. It was stated that the cost of the extension would be \$300,000, and that the road now owes \$100,000, having paid its expenses thus far. On motion of the Hon. G. F. Hoar, it was voted that it is expedient to proceed at once to extend the road to Winchendon, and that the directors be instructed to proceed at once to secure such additional stock subscriptions as may be necessary to build the road, and that they be instructed to report to the stockholders before proceeding to contract for the extension. The meeting adjourned to meet in Worcester, August 5, when the President is instructed to report on the general condition of the Worcester terminus of the road.

Baltimore & Ohio.

It is reported that this company has closed a contract with the Philadelphia, Wilmington & Baltimore Railroad Company, by which it secures the use of the road for its cars, or the traveling of its cars on satisfactory terms, for a term of years, and it is surmised, though apparently without any basis, that the Baltimore & Potomac is excluded from equal privileges. As the city of Baltimore has given the Baltimore & Ohio Company notice that it will not be permitted to run its cars through the city beyond a certain period, flits are being constructed upon which to transport them from Locust Point across an arm of the bay in front of the city. The distance is short, and it is thought will not involve any greater delay than the present system of pulling the cars through the city by horse power.

Logansport, Crawfordville & Southwestern.

Jon's & Schuyler, the financial agents of this company, will pay the coupons of the first mortgage 8 per cent. gold bonds, due August 1, at their office, No. 12 Pine street, New York, on and after that date.

Burlington, Cedar Rapids & Minnesota.

By the 1st of September it is intended to have what is called the "Milwaukee Branch" of this road ready for the iron. This section will extend from Cedar Rapids north through Centre Point and Independence to West Union, and thence northeast to Postville, on the Milwaukee & St. Paul road, about 25 miles west of McGregor.

The company has ordered eight new locomotives to be delivered next fall.

Milwaukee & Northern.

Mr. S. A. Harrison, the contractor for the 40 miles between New Holstein and Green Bay, has lately set a large force at work in Calumet County, transferring them from the Milwaukee & St. Paul's line between Milwaukee and Chicago, where he has just completed a contract.

Canada Southern.

The financial agents of the company announce the entire issue of first-mortgage bonds has been sold at 90. The rapid sale of these is largely due, doubtless, to the fact that so large a part of the work was completed before the bonds were offered, as well as to the favor with which the line is regarded.

Baltimore Short Line.

This company will receive proposals until 4 p. m. August 1, for the grading and masonry of eighteen miles of railroad, divided into eighteen sections, in which there is much heavy earth work and masonry. The office is at Athens, Ohio, and proposals may be addressed to the President, John Waddle, at that place. The road is intended to shorten the connection of the Marietta & Cincinnati with the Baltimore & Ohio, and will extend from Belpré, at the west end of the Parkersburg Bridge a little north of west directly to a connection with the Marietta & Ohio, whereas the present line of that road is up the river of Belpré a little east of north to Scott's Landing,

nine miles, before it turns westward. A saving of about 13 miles may be made by the new line.

Proposals for the work now advertised were received last Fall, but legal difficulties at that time prevented the letting of the work.

Cincinnati, Sandusky & Cleveland.

The lease of this road for 99 years to the Cleveland, Columbus, Cincinnati & Indianapolis Railroad Company is announced. The road consists of the main line from Sandusky southwest to Dayton, O., 155 miles, with a branch from Carey 50 miles from Sandusky, northwest to Findlay, 16 miles, another branch (leased) from Springfield east to Columbus, 45 miles. The section from Springfield to Dayton, 25 miles, was some time ago leased to the Cincinnati & Springfield (Short Line) Company, whose road, recently completed, is also leased and operated by the Cleveland, Columbus, Cincinnati & Indianapolis. The latter now operates 661 miles of road, consisting as follows: A line from Cleveland southwest to Cincinnati, 244 miles, through Crestline, Delaware, Springfield and Dayton; what may be considered as a loop of this line, from Delaware south to Columbus, and thence west of Springfield, 69 miles; a line from Galion, O., 80 miles from Cleveland, west by south through Bellefontaine, O., Union, Muncie and Anderson, I. d., to Indianapolis, 202 miles; and the newly leased line from Sandusky to Springfield, 130 miles, with its branch to Findlay, 16 miles.

Pittsburgh, Wheeling & Kentucky.

The extension of this road to the Kentucky line is contemplated, and the counties through which this extension will pass are to contribute \$10,000 to pay for a survey. The contributions asked for from the different counties are on a tax basis.

Detroit River Bridge.

A suit has been commenced in the Circuit Court of Wayne County, Mich., to enjoin the construction of the proposed bridge across Detroit River, between Amherstburg and Trenton. This bridge is to be constructed by the Detroit River Railroad & Bridge Company, and will be used by the Canada Southern road. The principal reasons alleged in the complaint are as follows:

"That the boundary line between Canada and the United States passes about 1,000 feet to the eastward of Stoney Island, and that over this 1,000 feet the water is nowhere more than from eight to ten feet in depth. That if a bridge should be constructed across the main channel the plan would probably be to build wharves out from Stoney Island over this 1,000 feet, and thus block it up. That the American channel between Grosse Ile and the American shore has a depth of water from 12 to 20 feet, and that the building of a bridge over it would seriously embarrass navigation, while a bridge over the eastern channel would be a serious obstruction to the navigation of the whole Northwest.

"It is alleged that no authority has been obtained from any source, under the provisions of the constitution, to construct the bridge now sought to be built across the western channel of the river, and the bill prays that the bridge company may be enjoined from so constructing it."

The Toledo Blade says that the American channel is of no importance for navigation, the lake marine using the British channel exclusively.

Organizing Railroad Companies in Illinois.

The Chicago Tribune gives the following abstract of the provisions for organizing railroads in Illinois by the new law:

"Any five persons may organize a railroad company, instead of 25, as formerly required. (Myers' Statutes, page 64.)

"Organizations to terminate in fifty years, but may be renewed, provided three-fourths of the stock votes in favor of it, and purchase balance of the stock. (Page 65.)

"May exercise the right of eminent domain or power of condemnation for right of way 100 feet wide, and for ground for depots and shops, and also to obtain earth, gravel, stone or other material—except wood or fuel. (Page 69.)

"Stockholders liable to creditors for only such prorata as is unpaid on their stock, instead of double the amount of their stock, as under the old law. (Page 69.)

"Consolidation with competing lines forbidden. (Page 71.)

"Legislature reserves the right to fix fares and prevent unjust discriminations, and to forfeit the charter in aggravated cases. (Page 72.)

"In voting, each stockholder may cast as many votes as the number of his shares multiplied by the number of directors to be voted for, and may cast the whole number of votes for one candidate or divide them among a greater number.

"In towns and counties where aid is obtained, contracts fixing rates of freights and fares may be filed in Recorder's office, and bind the railroad company for the time agreed upon." (Page 72.)

Delaware, Lackawanna & Western.

The Orange Chronicle gives the following information, said to be from a reliable source, about the new line of the Morris & Essex Division: "The new line, by which the track of the Morris & Essex Division is to reach the Central depot and ferry at Communipaw will leave the old track just below the old Fish House on the Passaic River, and cross the New Jersey road on a bridge. The line will run thence down the east bank of the Passaic, and intersect the Newark & New York Railroad on the neck between the Passaic and Hackensack rivers. From the Fish House a track will be laid north across the meadows, joining the track of the Boonton Branch east of Rutherford Park. This plan would make it necessary to raise the road from East Newark to the Fish House, or else to make the necessary rise for the bridge in that distance (about one and one-half miles)."

Nashua & Acton.

The Boston Advertiser says:

"Railroad schemes have their comic as well as serious side. About a year ago—at any rate, during the session

of the New Hampshire Legislature of 1871—we chronicled a railroad joke with a sober result, whereby, under the guise of a horse railroad, to be run by steam power if the city of Nashua should permit, the much-advertised and much-opposed building of the Nashua & Acton Road on that part of the route lying in New Hampshire was legally authorized. The joke was too good to allow of grumbling, but the result gained was too serious to allow of inaction. Workmen were put upon the new road, and rapid progress was made. The rival route applied for an injunction, and here comes in the "second part of the same tune." While this appeal was pending, the wisdom of the State, in Legislature assembled, finding the double-action horse-steam-power road well under way, granted the original request for a *bona fide* charter such as was refused last year, and the Governor affixed his signature, and the Nashua & Acton road became a fact. Bonfires, music, the ringing of bells, the burning of powder and shouts of men made Nashua noisy and demonstrative when the news arrived, and all was jolly save with those officials resident in the city to whom the jubilation was a loud reminder that in the New Hampshire Legislature "doubtful things are mighty uncertain," and that it is not safe to leave the field until the last enemy has disappeared. The Nashua & Acton road will be opened for travel in October."

The line of the road is from Nashua, N. H., nearly due south to Acton, Mass., 25 miles northwest of Boston. Buffalo & Jamestown.

The following are elevations above the starting point in Buffalo of points on Springfield route surveyed for this road: Concord Summit, 822 feet; Cataraugus Creek, 772 feet; Otto, or Waverly, 750 feet; Kelly Summit (Erie Railway crossing), 928 feet. From Buffalo to Springfield the distance is 27.59 miles; to Kelly Summit, 49 miles.

Ohio Railroad Valuations.

The total amount of railroad property as estimated by the several boards of county auditors for 1872, is \$68,173,555. The total amount as equalized by the State board is \$68,312,046. The amount as equalized in 1871 was \$64,876,682—an increase of 1872 over 1871 of \$3,435,364.

THE SCRAP HEAP.**A Novel Bulletin Board.**

A correspondent writes: "The stereotyped form of bulletin boards and half sheet cards as railway advertising mediums has become tiresome, and 'something new' was evidently needed. Mr. Beverley R. Keim, General Ticket Agent of the Kansas Pacific Railway, has literally 'taken the bull by the horns.' He issues an oval medallion on board, 6 ft. high by 5 ft. wide, with the advertisement of the railway handsomely painted and gilded on the outer circle; in the inner circle hangs a *bona fide* head of the buffalo or great North American bison, shot on the line and prepared by a professional taxidermist in the employ of the company. Mr. Keim is now having these put up in the principal hotels in our Eastern cities, and they attract very great attention. The fact of being able to see countless herds of buffalo on the journey between Kansas City and Denver is one of the special attractions offered to the tourist, and the Kansas Pacific Railway has adopted the buffalo head as a sort of trade mark."

This is a very good idea, doubtless, but it is not exactly novel. The Erie Railway has long had a magnificent buffalo head as a sign at its ticket office at the junction of Broadway and Fifth avenue, New York, and we believe others elsewhere. The Kansas Pacific, however, made a trade-mark of it long ago; and we believe it is since that time that the Union Pacific has quite commonly used an elk's head on posters, etc., and we think the Central Pacific sometimes uses a grizzly—though the *Overland Monthly*, before the railroad was, had made that animal pretty well known as an emblem of the Pacific coast. The idea of adopting an animal as a standard for a railroad seems a pretty good one—at least for advertising purposes; but if all were to do so we fear there would not be enough beasts to go around.

Steel-tired Car Wheels.

It is the "N. Washburn Steel Tire Works," of Worcester, Mass., that is making these wheels under Sax & Kear's patent, and not the Washburn Iron Company.

Convicts as Railroad Graders.

Alabama hires out its convicts to work on the railroads. Each has an iron spike about eighteen inches long around his ankle, held by a chain which reaches up to the waist. This contrivance keeps them from running. They trip and fall whenever making the experiment. The contractor feeds, clothes and guards the convicts, and pay the State forty cents a day for each man's labor. For every six months they faithfully work on the road a month is taken from their term of imprisonment.

Slandering Brakemen.

Some Western Journal thus slanders a whole class of railroad men: "Twenty-five cent diamonds are becoming so plenty among railroad brakemen that they are compelled to wear a piece of carpet over their shirt bosoms after dark to avoid giving lantern signals when moving about at stopping places."

How a Hot Journal May be Indicated to the Eye.

In a letter to the *Scientific American*, Prof. R. H. Taunton, of the Stevens Institute of Technology, says:

"My ingenious and able colleague, Dr. Mayer, has recently been experimenting, during the course of an interesting investigation, upon a number of substances which change color on raising their temperature and regain their original hue when cooled.

"Iodide of mercury is one of these substances, and he suggests that if a bearing, to which access is difficult while machinery is in motion, or which, for other reasons, cannot be conveniently reached by the hand and its condition thus known, be painted with iodide of mercury or some such material of changeable color, its darkening when the journal heats, may make it a valuable indicator. Its change—from bright red to black at about 70 degs. C.—would attract attention from a considerable distance."